

# SCIENTIFIC AMERICAN



Copyright by Panama-Pacific Exposition.

TRIUMPHAL ARCH OF THE RISING SUN, SURMOUNTED BY THE GROUP OF "THE NATIONS OF THE EAST."—[See page 194]

INDEPENDENT BREWING CO.  
7 WHITE TRUCKS

B. BALTMAN & CO. 35 WHITE TRUCKS

GREENFIELD ELECTRIC LIGHT & POWER CO.  
10 WHITE TRUCKS

GIMBEL BROTHERS  
54 WHITE TRUCKS

ARMOUR & COMPANY  
27 WHITE TRUCKS

THE CLEVELAND AARON BAG CO.  
19 WHITE TRUCKS

W. & J. SLOANE  
15 WHITE TRUCKS

SOUTHERN EXPRESS CO. 8 WHITE TRUCKS

THE BELL CO. 12 WHITE TRUCKS

CITY OF PITTSBURGH  
15 WHITE TRUCKS

SUPREME BAKING CO.  
18 WHITE TRUCKS

JOSEPH HORNE CO. - 30 WHITE TRUCKS

CITY OF NEW YORK  
12 WHITE TRUCKS

KAUFMANN & BAER CO.  
40 WHITE TRUCKS

THE B.F. GOODRICH CO. - 18 WHITE TRUCKS

ATLANTIC ICE & COAL CORPORATION  
15 WHITE TRUCKS

BOGGS & BUHL 28 WHITE TRUCKS

TELLING'S ICE CREAM

TELLING BROTHERS CO.  
10 WHITE TRUCKS

ASSOCIATED BELL TELEPHONE CO'S  
45 WHITE TRUCKS

NY BOARD OF UNDERWRITERS 14

CITY OF CLEVELAND  
17 WHITE TRUCKS

THE HUB 10 WHITE TRUCKS

UNITED STATES POST OFFICE DEPT.  
28 WHITE TRUCKS

EVANSVILLE BREWING ASSN. 8 WHITE TRUCKS

NATIONAL CASKET CO. 14 WHITE TRUCKS

AMERICAN CAN CO. - 8 WHITE TRUCKS

MANDEL BROS. 17 WHITE TRUCKS

T. EATON CO. LTD. 14 WHITE TRUCKS

STERN BROTHERS - 18 WHITE TRUCKS

KAUFMANN BROS. 24 WHITE TRUCKS

SCHULZE BAKING CO. 12 WHITE TRUCKS

OPPENHEIM COLLINS & CO. WHITE TRUCKS

THE ATLANTIC REFINING CO. 7 WHITE TRUCKS

FRANK PARMELEE CO.  
9 WHITE TRUCKS

SPEAR & CO. 13 WHITE TRUCKS

MARSHALL FIELD & CO.  
15 WHITE TRUCKS

THE HIGBEE COMPANY  
10 WHITE TRUCKS

STANDARD OIL CO. OF NEW YORK  
76 WHITE TRUCKS

CHICAGO FIRE INSURANCE BOARD  
13 WHITE TRUCKS

GULF REFINING CO. 101 WHITE TRUCKS

STANDARD OIL CO. OF INDIANA  
65 WHITE TRUCKS

CITY OF BOSTON 21 WHITE TRUCKS

THE MAY COMPANY  
11 WHITE TRUCKS

D.O. SUMMERS CLEANING CO.

## This Is Prestige

... that a man buy again

THIS page is a record of White Truck prestige. These names familiar for the commercial wisdom they stand for nationally and locally represent purchasers of large fleets of White Trucks.

A good judge of trucks as well as one uninformed may make a mistake in his first truck purchase. But when he continues to buy the same truck again and again as his needs expand ... the evidence of satisfaction is overwhelming.

Whether you are ready for purchase this year or not ... permit us to send you illustrated data of White Trucks now in operation built to meet delivery conditions similar to your own.

*Exhibiting at the Transportation Building, Panama  
Pacific International Exposition, San Francisco*

### THE WHITE COMPANY

CLEVELAND

LARGEST MANUFACTURERS OF COMMERCIAL  
MOTOR VEHICLES IN AMERICA

New York . . . . . Broadway at 62nd Street  
 Chicago . . . . . 2635-2645 Wabash Avenue  
 Philadelphia . . . . . 216-220 North Broad Street  
 Boston . . . . . 930 Commonwealth Avenue  
 San Francisco . . . . . Market Street and Van Ness Ave.  
 Baltimore . . . . . Mt. Royal and Guilford Avenues

Pittsburgh . . . . . Craig Street and Baum Boulevard  
 Atlanta . . . . . 63-65 Ivy Street  
 St. Louis . . . . . 3422 Lindell Boulevard  
 Washington . . . . . 1233 20th Street, N.W.  
 New Orleans . . . . . 750 St. Charles Avenue  
 Newark . . . . . 33-35 William Street

Seattle . . . . . 1514 Third Avenue  
 Memphis . . . . . 278-280 Monroe Avenue  
 Dallas . . . . . 2025-2027 Commerce Street  
 Toronto . . . . . 14 Alexander Street  
 Montreal . . . . . Forum Building  
 Winnipeg . . . . . 230 Fort Street

# SCIENTIFIC AMERICAN

THE WEEKLY JOURNAL OF PRACTICAL INFORMATION

VOLUME CXII.]  
NUMBER 9.

NEW YORK, FEBRUARY 27, 1915

[10 CENTS A COPY  
\$3.00 A YEAR

## The Bushmen of the Moori River, Natal

By D. Waterson

NEAR the source of the Moori River, Natal, some 6,000 feet above sea level, are some curious rock pictures made by Bushmen, and the owner of the property had some photos taken for me. These Bushmen, like Diogenes, have reduced their wants to minimum. They rarely build a hut, but prefer the natural caves they find in the rocks, or they form a kind of nest in the bush. Their garments consist only of a small skin; their spears are mere branches of trees, to which is tied a piece of bone or flint. The arrow is a reed treated in the same way, and all weapons are poisoned. They have no flocks and hunt with the help of dogs as wild as themselves. A rounded stone, perforated in the middle with a piece of wood inserted, serves to dig up edible roots, while fire is produced by rubbing two pieces of wood.

Their faculty of imitation is great, and is well illustrated by the paintings shown and by the carvings on the walls of their caves and rocks.

These are done with different colored clays, and the carving with a flint chisel only.

Many pictures come close to caricatures. The Boer, the Hottentot with his large feet and grotesque body are unmistakably delineated. Elephants, ostriches, antelopes, hunters are all shown.

It is a curious spectacle to see these naked savages painting with a reed or carving with a piece of flint, and coloring them with ochre.

These curious little people, light-skinned, hair growing in tufts, ridiculously developed in the buttocks, yet with very small hands and feet, are keen lovers of freedom. They acknowledge no master and possess no slaves. Possessing a most rudimentary religion they are far superior to the Hottentot, never being uselessly cruel and showing kindness to fellow tribesmen. They are distinct from all other African races, have a strange and difficult language, and are divided into small tribes scattered and isolated all over southern Africa.

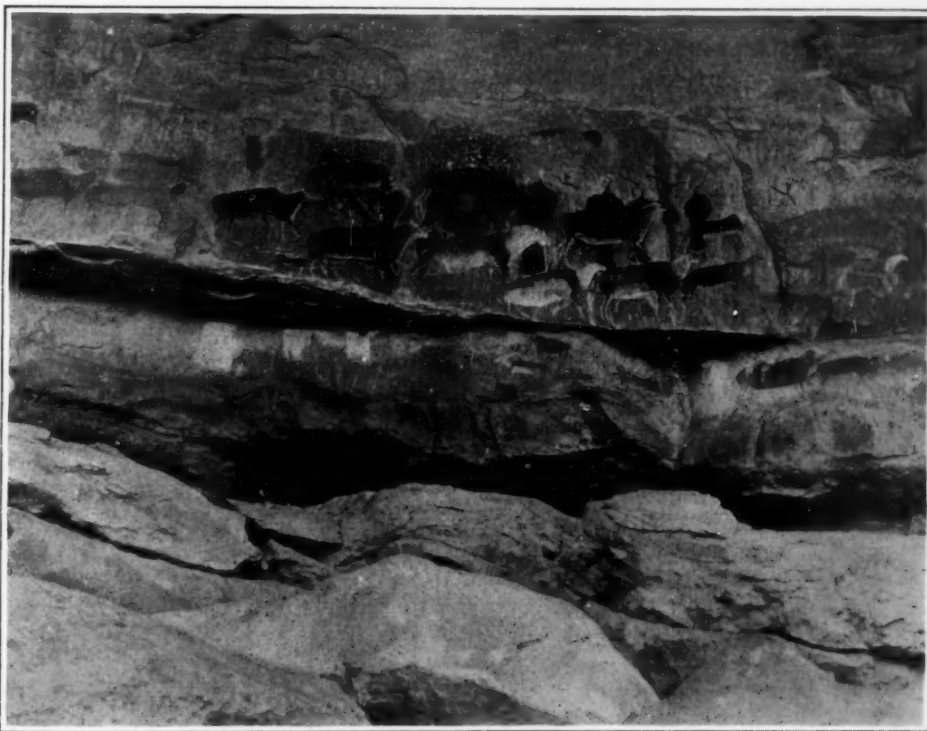
## New Method for Concrete Flooring

A RECENTLY patented system for reinforced concrete flooring was applied with success to a 6-story apartment house erected at Paris. All the floors, as well as the roof terrace, were constructed on the new method of molding, which is the invention of Engineers Ferrand and Pradeau. A series of rein-

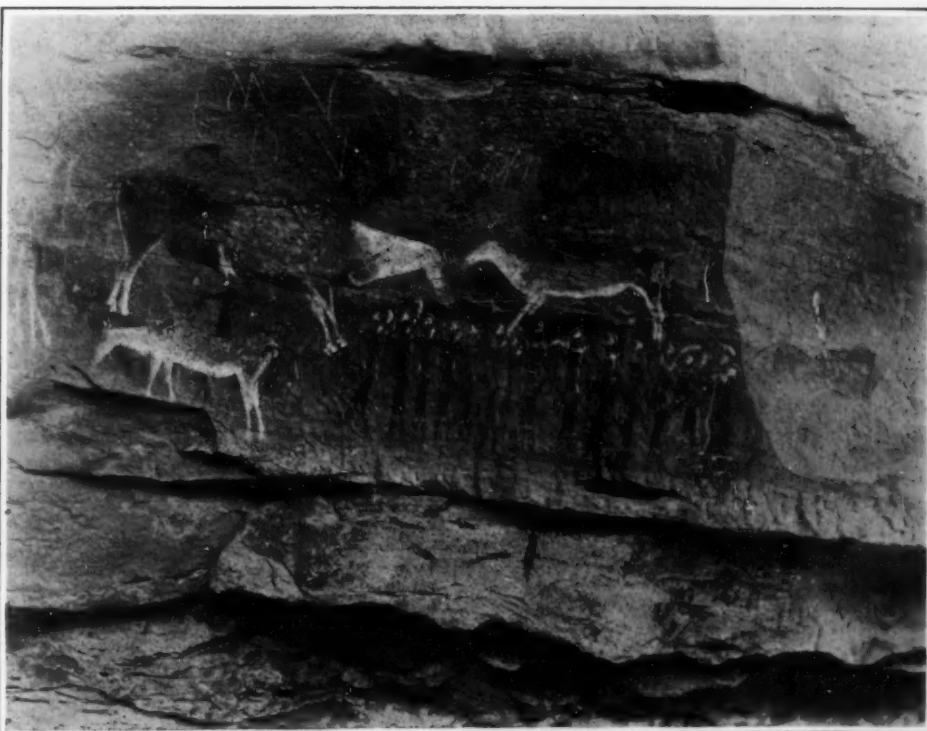
forced concrete beams running across the building in the usual way, serves as the basis for the flooring. A set of light planks is laid from beam to beam for scaffolding, and properly spaced at even distances. There are prepared hollow molds in plaster about 8 feet long and 5 feet wide, and about the thickness of the flooring. Such molds have a somewhat elliptical curve at the top, with straight flat bottom and somewhat inwardly sloping sides. All the plaster molds are laid upon the planking end to end, and there is a certain space between the sides of the molds, that is where they rest upon the plank, this latter of course running parallel to the molds. Then reinforcing iron rods are

properly laid down, and concrete is molded on after the usual manner. The part of the concrete that lies between the plaster molds thus forms a series of vertical webs, limited at the bottom by the wood planks, and as the concrete is put on to several inches above the tops of the plaster molds, it has a flat surface all over the floor. The plaster molds remain in place and are part of the flooring, being buried in the concrete, except on the under surface, and aid in consolidating the floor, for such molds themselves are braced in their hollow cavity by two vertical webs in the middle, the walls and webs of such molds being a few inches thick. Combined with the concrete, this makes up a solid floor, and

what is of great advantage is that there is now given an under surface (formed for the main part by the flat bottom of the plaster molds), which is ready to receive the ceiling plaster, without the use of lath or any other preparation. After the cement has set, the wood planking is withdrawn from underneath, for according to the reinforced concrete construction, the flooring is made to rest eventually on the main stringers of the house, the under boarding being only to uphold the work during the molding of the concrete. Because of the air space in the plaster forms, there is given an air cushion which makes such floors sound-proof, this being another good point, and it is also to be noticed that the hollow plaster part makes a series of natural conduits for electric wires, piping, and the like.



Rock paintings by Bushmen, showing caves in which these men live.



Bushmen's paintings in a cave near the source of the Moori River, Natal.

## Fluorescent Photographs of Palimpsests

FOR some time the study of palimpsests has been facilitated not only by ordinary photography, but by ultra-violet photography. An even greater amount of success in reclaiming ancient texts from old parchments has been obtained recently by the use of fluorescent photography. This new method, invented by P. Raphael Kogel, was described at the meeting of the Royal Prussian Academy of Sciences, which took place at Berlin, on October 29th of last year.

The new method is based on the fact that parchment fluoresces under the influence of the ultra-violet rays, while the written characters remain almost entirely dark. Mr. Kogel states that this fluorescent photography gives on the average 50 per cent better results in the deciphering of old texts than either ordinary photography or ultra-violet photography, both of which he had previously employed. The communication was made before the session of the "Phil.-hist. Klasse" of the Academy.

## SCIENTIFIC AMERICAN

Founded 1845

NEW YORK, SATURDAY, FEBRUARY 27, 1915

Published by Munn & Co., Incorporated. Charles Allen Munn, President, Frederick Converse Beach, Secretary, Orson D. Munn, Treasurer, all at 361 Broadway, New York

Entered at the Post Office of New York, N. Y., as Second Class Matter February 1, 1896, under Post Office No. 100,000. Accepted for mailing at special rate of postage provided for in Act of October 3, 1917, authorized on July 16, 1918. Postage paid at New York, N. Y., and at additional mailing offices. Canada.

Trade Mark Registered in the United States Patent Office. Copyright 1915 by Munn & Co., Inc. Illustrated articles must not be reproduced without special permission.

## Subscription Rates

Subscription one year, postage prepaid in United States and possessions, Mexico, Cuba, and Panama	\$3.00
Subscriptions for Foreign Countries, one year, postage prepaid, including Canada, one year, postage prepaid	4.50 3.75

## The Scientific American Publications

Scientific American (established 1845)..... per year	\$3.00
Scientific American Supplement established 1876.....	3.00
American Homes and Gardens.....	3.00
The combined subscription rates and rates to foreign countries including Canada, will be furnished upon application.	

Remit by postal or express money order, bank draft or check

Munn &amp; Co., Inc., 361 Broadway, New York

The Editor is always glad to receive for examination illustrated articles on subjects of timely interest. If the photographs are sharp, the articles short, and the facts authentic, the contributions will receive special attention. Accepted articles will be paid for at regular space rates.

*The purpose of this journal is to record accurately, simply, and interestingly, the world's progress in scientific knowledge and industrial achievement.*

## On the Edge of the Maelstrom of War

THE determination of President Wilson to call in all the political engineers at his command to jam through Congress a bill, whose immediate effect may well be to involve us in the European conflict, is a piece of the most amazing inconsistency that ever threatened to shake the public confidence in the prudence and wisdom of the Executive Office.

Altogether timely and fitting and universally approved throughout the country was the President's appeal to the citizens of this country, issued immediately upon the declaration of war, to preserve an attitude of the strictest neutrality.

In the same spirit and to the same degree that the country applauded that manifesto, does it now stand against to see its President fathering and diligently fostering a measure which, in its effect upon the warring nations, may prove to be a veritable firebrand. A conflict of the titanic nature of that now being waged in Europe shakes the whole world to its very foundations. There is not a nation, however small, whose interests are not affected and whose peace may not ultimately be endangered; and the risk of embroilment increases proportionately to the size and wealth and military and political standing of every nation affected.

The United States, as by far the largest and most important of the countries not hitherto entangled in the conflict, is peculiarly liable, because of its far-reaching interests, to be caught somewhere or other in the tolls; and it is a most sacred and binding obligation upon those who happen, for the time being, to constitute our Government, to avoid taking any legislative steps which, even in the most remote degree, might irritate the overstrained nerves and susceptibilities of the great nations engaged in this war.

Now the eagerness with which the President is endeavoring to force his Ship Purchase Bill upon the country, is due to his honest, though sadly mistaken belief that this measure will solve the problem of up-building our merchant marine—a question in which for many years he has taken the deepest interest. We are willing to give him credit for the very highest motives, founded, although they are, upon a totally mistaken understanding of the situation. But this does not change the fact that the bill is the most serious menace to our peaceful relations with the warring nations that has developed since the opening of the war.

Say what they will, the sponsors of this measure must by this time be aware that the only possible source from which they can hope to secure the \$40,000,000 worth of shipping called for is the German and Austrian ships which are at present interned in neutral ports. Senator Burton, in the article which we publish elsewhere in this issue, and at greater length in his various speeches, has shown that the proposed partnership of the Government with a corporation is a legal subterfuge, and that the ships, if they are purchased, will be, to all intents and purposes, and certainly in the eyes of international law, the property of the United States Government. Certain it is, also, that if they set sail, they will be liable to seizure by the enemy's cruisers, whether German, British, or French, and equally true it is, that should any one of these ships be found to be carrying contraband, the United States Govern-

ment would stand guilty of a flagrant breach of neutrality and would be in danger of quick embroilment in the present struggle.

The President possesses a mind too logical in its processes for him not to be perfectly well aware that his insistence on the passage of a bill such as this is in direct contradiction to his attitude in urging upon the country at large the preservation of an attitude of strict neutrality.

Well might Senator Burton say, as he does in the article published on another page: "I am sorry to say that there are a great many people in the United States who do not seem to realize that we are in the midst of the most titanic conflict between nations that the world has ever seen"; and we feel constrained to add that the present Administration, in endeavoring to force this perilous measure through Congress, seems to be steering the Ship of State on the edge of the maelstrom of war with a careless fatuity that is simply appalling.

We commend to the careful attention of our readers the article by Senator Burton criticising the policy of this Administration, which is published elsewhere in our columns. To us and, we believe, to the great majority of our readers, the Senator's trenchant arguments, based as they are upon a lifelong study of the shipping problem, are simply unanswerable. Judging from the tone of the correspondence which reaches this office, the great majority of the people of this country are not in sympathy with the Administration's bill; first, because they believe that, politically and economically, it is based upon false principles; second, because it will drive what shipping we have from the high seas; and, thirdly and chiefly, because they see in it the probable seeds of war. Therefore, we strongly urge upon the constituents of the country that it is their duty to make personal appeal to their Senators, and urge them to throw party considerations to the winds and unite in the defeat of the most dangerous and menacing bill that has been brought before Congress for many years past.

## Preparedness the Only Sure Guarantee of Peace

THE assumption that the victors in the great war now being waged in Europe will emerge broken and exhausted is the deduction of ignorance and unwarranted by the experience of the past. Was the North exhausted by the civil war in the sense of being unready for further military effort? Quite the reverse—her population had increased and her host of well trained veteran soldiers, her ample equipment, and munitions of all kinds made it practicable for her to speak in no uncertain terms to France concerning Mexico. Does anyone suppose that had the North at the commencement of the civil war been as strong, as experienced, and as well prepared as she was at the end, that the South could have offered effectual resistance?

Does Russia show, at the present, exhaustion as a result of the war with Japan? Every soldier and all intelligent laymen know that Russia, from the military standpoint, greatly benefited by that war, and that to-day she has better equipment, arms, organization, and morale than before. Serbia, small in territory, poor in resources, fought Turkey, then Bulgaria, and almost without a breathing spell has waged a remarkable campaign against the great forces of Austria—and so on ad infinitum.

The pacifists ask who is to attack us. The same type of people asked the same question in England a year ago. We are not urging preparation for a war with any particular people; we are rather urging preparation against war with any and all people. Certainly reasonable and careful preparation against house-breaking gives a better chance of security than open doors and complete heedlessness.

Some of our statesmen, who have been intimately connected with the building up of the present pernicious system of army posts and administration and with its continuance, state with bland simplicity that we have spent much money and must therefore be prepared. As a matter of fact, we are almost wholly unprepared, and every well-informed military man in the country knows it.

We have, it is true, more arms than we had last year, but how many more? And how long will it take us to secure the modest reserve recommended by the General Staff? This is the question the American people want answered! "All the people cannot be fooled all the time" by juggling with words and figures. The question asked is: Are we ready? The honest answer is no. No; far from it, years and years away. Every foreign power knows it and knows that we could not get ready within the period measured by a modern war. Much money has been spent, but the facts remain that the regular army is without the necessary organization—the reserve of men needed to fill up existing organizations to full strength, the reserve of ammunition for the artillery, the ammunition trains, the transport trains, and

many other necessary things. The militia is even worse off, and is as a body only poorly instructed. The coast artillery is short of men and ammunition, and there are no available troops to co-operate with it against attack by landing parties. Searchlights, which are absolutely essential for coast defense, are largely wanting. Fire-control systems are in many forts improvised and unsatisfactory.

But we are told that we must be prepared because we have spent large sums of money. Other equally statesmanlike utterances are heard to the effect that a million men, full of the ardor of battle, will spring to arms between sun and sun. How utterly silly is this kind of noise. Look at England, striving to make soldiers after war has commenced, without officers or non-commissioned officers to train her recruits. Cannot we learn something from observation? Is it not time to stop talking without thinking and do something before it is too late? Ask your military experts to work out and present to Congress a plan of procedure, and for a time place the political military expert on the shelf. He costs too much.

## The Battle With Foot-and-Mouth Disease

IN view of the fact that the drastic methods used to combat the foot-and-mouth disease have evoked criticism on the part of cattle owners, statistical information in regard to the outbreak and its treatment, just published by the United States Bureau of Animal Industry, is of timely interest. Wherever a single animal in a herd has been found to be diseased, the entire herd has been slaughtered. An exception was made in the case of the National Dairy Show cattle, at Chicago, where a rigid quarantine was established and the herd spared, but the expense proved to be far too great to justify this procedure in ordinary cases. The total number of herds slaughtered was 2,046, consisting of 46,268 cattle, 7,151 sheep, 22 goats, and 47,735 swine, having an aggregate estimated value of \$3,396,110. Illinois has had the largest infected area, 50 out of a total of 102 counties being affected. The animals slaughtered in that State were appraised at \$1,446,985.

These figures cease to appear large when compared with the total extent of the livestock industry in the United States. On January 1, 1915, the number of cattle in this country was estimated at 58,329,000. Hence the number of cattle slaughtered in stamping out foot-and-mouth disease has been less than eight hundredths of one per cent of the total, and though the work is not yet complete the total loss will probably not exceed one tenth of one per cent. The number of animals slaughtered does not exceed the number killed in two or three days in some of the larger packing house centers. The bureau claims that if the plague had been temporized with and had been allowed to get beyond control the United States would doubtless have had to endure permanently an annual loss of many million dollars.

From a circular issued last month by the Illinois Agricultural Experiment Station we get an insight into the critical situation that has existed in that State, especially as to the differences of opinion between many cattle owners on one side and the United States Bureau of Animal Industry and the Illinois State Live Stock Commission on the other, concerning the proper methods of handling the situation.

The financial loss entailed upon individuals by the slaughter of herds has undoubtedly been serious. The federal authorities agreed to pay half of the appraised value of the slaughtered animals, and there was an understanding, but no legal provision, that the State would pay the other half. The appraised value of an animal does not cover its breeding value, nor the disorganization of farm business which results from the destruction of a herd. The latter is especially important on dairy farms, where the farm plan calls for a herd to consume the forage. Where a herd is destroyed it cannot promptly be replaced, both on account of the temporary prohibition of stock shipments and also on account of the danger of immediately restocking an infected farm.

The answer to these complaints, however, seems to be that more liberal provision should be made for making good the losses of the owners, and not that any relaxation should be permitted in the stringent measures which, in view of the remarkable infectiousness of this disease and in the light of experience gained in previous outbreaks, have heretofore been adopted by the authorities.

The fact that in one month the disease spread from a single point in Michigan to New England in one direction and Montana in the other indicates the magnitude of the problem with which the Federal and State officers have had to deal.

Most important of all is the fact that if this disease had been allowed to establish itself as a permanent factor in the American livestock industry, the result would necessarily have been a permanent increase in the already high prices of meat and dairy products.

## Notes on the War

**A Fine Engine Room Performance.**—The sinking of the German cruiser "Nürnberg" by the British cruiser "Kent," in the action off the Falkland Islands, was due, primarily, to the remarkable work done by the engine room and stoke-hole staffs of the "Kent." The trial speed of the "Kent," which was an eleven-year-old ship, was 22½ knots and it looked as though her attempt to overtake the 23½ knot "Nürnberg" would be fruitless. But in response to the captain's appeal, the engineering force managed to push the speed up to 24 knots per hour, or one knot more than the ship had ever steamed since she first went into commission, and gradually she overhauled and got within range of the enemy.

**A Life-saving Waistcoat.**—Men who were saved from the "Formidable" which, it will be remembered, was torpedoed in the English Channel, speak favorably of a life-saving garment, known as the Gieve Waistcoat, which can be worn underneath the coat and is inflated by means of a tube. Similar in purpose, but constructed on another principle, is the Boddy life-saving waistcoat, which is said to have been adopted by the British Admiralty. It is stuffed with Kapok, a substance five times as buoyant as cork. Eighteen ounces of Kapok are worked into each waistcoat. Because of the extreme fineness of the fibers the air is retained; moreover, there is a slight greasiness which prevents the material from absorbing water. Kapok is obtained from the pod of a tree grown in Java.

**Value of Fortresses.**—According to the Paris correspondent of the *Army and Navy Journal* it is a mistake to say that the prestige of permanent fortifications has been altogether lost as the result of the fall of Liege, Namur, Antwerp, Maubeuge and other fortified camps. The Belgian and French fortresses were sadly out of date, both in armament and in defensive organization, and were crushed by heavy artillery to which they could make no reply. The other side of the question is shown by the effective resistance of the entrenched camps of Verdun, Toul, Epinal and Belfort. These fortifications are modern; and it is a fact that they have defied the whole might of heavy German guns and the attacks of masses of German infantry. Modern guns have been added since the war, and some are being built which have a range of 18,000 to 20,000 yards.

**War and Financial Exhaustion.**—Dr. Helfferich, a leading director of the Deutsche Bank, has made a comparison between the total capital wealth of Germany and her opponents in the war. He finds that Germany has a total wealth of from 14,200 million to 15,600 million pounds sterling, France 11,400 millions, and England 11,300 to 12,700 millions, and with these he compares the United States, whose total capital wealth he estimates at 24,500 million pounds sterling. These quotations are made from a British quarterly, the *Round Table*, which states that in a war of the present magnitude, every country undoubtedly lives on its capital to a great extent. All expenditures are reduced to a minimum; the country's fixed plant runs down, and generally speaking the wealth of the country diminishes. Nevertheless a country can live partly on its capital—just as a private person can—for a very long time.

**High Angle Fire on German Warships.**—The usual range of elevation for the guns of the main battery of warships is from 5 degrees below the horizontal to 15 degrees above; but the Germans have given to their guns big and little, the ability to elevate to 30 degrees above the horizontal, or even more than that. The object of this was to enable the guns to be elevated above the horizontal, even when the ship, due to penetration below the water line, was listed several degrees toward the enemy—a very wise provision. This arrangement has conferred the added advantage of greatly increasing the range, and the result was shown in the Falkland Islands fight when the 8.2-inch shells of the "Scharnhorst" reached and several times struck the British battle cruisers at a range which was probably between 14,000 and 16,000 yards. At that distance the falling angle of the German shells is stated to have been fully 45 degrees.

**The So-called Blockade by Submarines.**—One hesitates to speak of the humorous side of such a ghastly tragedy as the present war in Europe; nevertheless the statement of the German government that it was about to establish a blockade of Great Britain by its submarine fleet must have provoked a smile among naval men and all those who are familiar with the limitations of the submarine and the small number in Germany's submarine fleet. If we take into account the known and the possibly larger unknown losses among the German submarines, it seems probable that at the present time they do not possess more than thirty to forty of these vessels. If they had from three to four hundred of the very latest type, the threat might amount to something. That the German boats can now and then find themselves athwart the course of an unarmed tramp and get near enough to sink it, is quite possible. But to announce that a blockade is to be established is to be guilty of a bluff of the first magnitude.

## Science

**The Anglo-Swedish Antarctic Expedition,** which was to have sailed this year for five years of exploration from a base in Graham Land, has postponed its departure until 1916 on account of the war.

**Meteorological Observations in Germany.**—A letter from the director of the Royal Prussian Meteorological Institute, quoted in the *Monthly Weather Review*, states that regular meteorological observations are being maintained as usual throughout the German Empire, notwithstanding the war. Weather forecasts are issued regularly, though the cessation of cable and telegraphic reports from a number of foreign stations, including those in Iceland, makes the forecaster's task unusually difficult.

**A New Building of the Mellon Institute Dedicated.**—The new building of the Mellon Institute of Industrial Research and School of Specific Industries, University of Pittsburgh, was dedicated on February 26th, the address being made by Dr. Rossiter Worthington Raymond, and a reception was given in the new building in the evening. The first Mellon lecture in the lecture hall of the new quarters was announced for the following day, to be delivered by Prof. John J. Abel, of Johns Hopkins University, under the auspices of the Society for Biological Research of the University of Pittsburgh, whose subject was "Experimental and Chemical Studies of the Blood and their Bearing on Medicine."

**Tetanus in Vaccine Virus.**—The Public Health Service has published as Bulletin No. 95 of the Hygienic Laboratory the results of certain investigations by Surgeon Edward Francis, which, according to the Surgeon General, "will undoubtedly be of much value in overcoming the alarm in certain quarters as to the danger of contracting tetanus from vaccination." An attempt was made to produce tetanus in monkeys by virus artificially contaminated with tetanus spores. The result was altogether negative, from which is inferred the difficulty, if not the impossibility, of producing tetanus in human beings by the same process. Two cases of tetanus, supposed to have resulted from vaccination, were investigated, and in each instance it was found that the tetanus organism had undoubtedly been introduced subsequent to vaccination, probably owing to lack of care of the wound. The service finds in these two fatalities confirmation of the belief that the use of a vaccination shield in the absence of certain, frequent and careful attention of the wound is to be condemned.

**Fish Culture on Farms.**—The last annual report of the Commissioner of Fisheries calls attention to the desirability of developing widespread interest in pond culture, both in artificially constructed fish ponds and in the natural inland waters of small area in this country. Thousands of acres of land unsuitable for agriculture or other established industries might be made to yield fish, and this movement might help to bring down the cost of living. The Commissioner says: "It is very common to see ponds, swamps, and small sheets of water lying useless, and marshy meadows producing nothing except a small quantity of inferior grass. With a small amount of labor and capital such places might be transformed into ponds, which, aside from their value for fish culture, would be of material benefit to farmers as reservoirs for the storage of water for irrigation during periods of drought." Young fish for stocking ponds and all necessary advice and instructions can be obtained free of cost by addressing the Commissioner of Fisheries in Washington.

**The House Centipede (*Scutigera forceps*),** which has always been a too familiar inhabitant of human dwellings in the southern United States, has gradually spread northward, until now it is very common throughout New York and New England, and extends westward well beyond the Mississippi. The Department of Agriculture has just issued a brief bulletin in regard to this creature, which is not a true insect, but one of the myriapods. It thrives in damp places, being particularly abundant in bathrooms, moist closets, and cellars, multiplying excessively also in conservatories, especially about places where pots are stored, and near heating pipes. The centipede, like other members of the animal kingdom, including man, is neither wholly bad nor wholly good. It feeds on house flies, roaches, moths, and other forms of life commonly rated as pests, probably including bedbugs. Its method of catching an insect seems to be to spring over it, inclosing and caging it with its many legs. The belief occasionally met with that the centipede feeds on household goods and woollens or other clothing is without foundation. On the other hand, the bite of this creature is undoubtedly more or less poisonous, the effect depending upon the susceptibility of the patient. There are, however, very few cases on record of its having bitten any human being, and it is very questionable whether it would, unless provoked, attack any large animal. If pressed with the bare foot or hand, or if caught between sheets in beds, it will undoubtedly bite in self-defense, and severe swelling and pain may result. Prompt dressing with ammonia is the best treatment of such bites.

## Astronomy

**A New Comet.**—A telegram received at Harvard College Observatory from Mr. John E. Mellish, of Cottage Grove, Wisconsin, announces the discovery of a small bright comet by him in R. A. 17h. and Dec. + 3 deg. The comet was moving slowly eastward.

**Absolute Size of the Stars.**—The latest attempt to determine the absolute diameter of a number of fixed stars is that of Signor Ferrara, of Teramo, Italy, who publishes his results in the *Rivista di Astronomia*. Among the stars having a measurable parallax he estimates, from photometric measurements, that Canopus is the largest, with a diameter 51 times as great as that of the sun. Other large stars, and the ratios of their diameters to that of the sun, are: Castor, 18; Arcturus, 10.4; Pollux, 8.7; Capella, 8; Vega, 6.8. Such determinations are, of course, highly problematical.

**Maintenance of Solar Heat.**—Discussing this well-worn subject in the *Comptes rendus*, M. A. Véronnet attempts to calculate the time the sun's activity could be maintained by (1) chemical action, (2) intra-atomic energy (radium), and (3) the work of gravitational contraction. For the first he gets 2,000 years, for the second only 170 years, while for the third he finds that gravitational contraction, according to the well-known theory of Helmholtz, would account for several millions of years of solar heat, as demanded by the geological record. The fall of meteorites into the sun could account, at most, for only the four hundredth part of the sun's heat.

**Meteor Observations in America.**—The American Meteor Society has announced that it would be glad to secure any unpublished meteor records, of any year, and to undertake their discussion and reduction. Communications on the subject should be addressed to Prof. Charles P. Olivier, Leander McCormick Observatory, University of Virginia. This society, founded in 1911, has a membership of only twenty; a good index of the small amount of attention paid in this country to the observation of meteors. The members include both amateur and professional astronomers, who make their observations in accordance with a uniform plan, and forward the results to the headquarters of the organization to be digested and published.

**Why Jupiter has Belts.**—It has been suggested by Lau that the reason Jupiter has belts instead of zones of spots is to be found in its rapid rotation. The material forced upward from the lower strata of the planet, bringing with it a smaller linear velocity than that of the surface, streams eastward and assumes the appearance of elongated streaks. If the centers of eruption are sufficiently numerous, belts are formed; and it is suggested that, were the sun's rotation much more rapid than it is, the solar surface at spot maximum would also present dark streaks or belts. In accordance with this theory of belt formation it will be remembered that the great revival of Jupiter's north equatorial belt in 1912-1913 began with the outbreak of a few isolated dark spots, which quickly spread out around the planet.

**Car a's 72-inch Reflector.**—Work is progressing rapidly on this instrument, which will be probably, for a short time only, the largest telescope in the world (pending the completion of the 100-inch reflector for Mt. Wilson). The disk for the great mirror started from Antwerp about a week before the war broke out. After its arrival at New York the Pennsylvania Railroad was about a week in finding a suitable car to transport it to Pittsburgh, and then there was further delay before an iron wagon could be obtained to transport it to Dr. Brashear's workshop, where it was finally placed on the grinding table. The hazardous work of boring and smoothing off the hole in the center of the mirror has been accomplished with entire success. It is expected that the mounting will be completed by October next.

**Wave Lengths and Radial Velocities in the Orion Nebula.**—The application of the interferometer to astronomical purposes, as described by Messrs. Fabry and Buisson in the *Astrophysical Journal* for June, 1911, has since yielded interesting results which have from time to time formed the subject of notes in the *Comptes rendus*. The latest of these records measurements of radial velocities in the portion of the Orion nebula which contains the "trapezium." From these it is found that the distance between the nebula and the earth is increasing at the rate of 9.8 miles a second. While this is the average of measurements at different places in the nebula, the actual radial velocity varies from point to point; in other words, the nebula is not moving with the coherence of a solid body, but is undergoing numerous local deformations, besides which, in the region examined, there is a movement of quasi-rotation around an axis running from southeast to northwest. Having determined the radial velocity by the use of a hydrogen line, measurements were made of the apparent wave-lengths of the nebular lines, in the ultra-violet, and these were corrected for the radial velocity, as previously determined, in order to obtain the absolute wave-lengths of the nebular lines, which were found to be 3,726.100 and 3,728.838. These do not correspond with the lines of any known terrestrial element.

## The Great International Panama-Pacific Exposition

How the United States of America Will Commemorate a Great Engineering Achievement That Promises to Effect a Readjustment of the Lines of Commerce of the Entire World



The Fountain of the Earth.

An Exposition Which Will Symbolize the Advance of Humanity and Which Will Contribute to a Better Understanding of Peoples and the Widening of the Influence of the United States

At its inception undoubtedly the only thought of the purpose of the Panama Canal, at least in the mind of the general public, was the closer linking of the great Pacific coast region of our country with the East, a closer commercial and social connection that would be of common benefit to all; but as time passed, and conditions were studied more carefully, it became evident that the Panama Canal was destined to become an epoch-making factor in the world's history, not only

of North America has been practically isolated from the rest of the world, and although a region of vast resources and possibilities it has been so difficult of access that it is practically undeveloped. The same is true, in varying degrees, of the coast of Siberia, Western South America and Australia, not to speak of the numberless islands of the Pacific, for indeed the entire territory lying in and adjoining the vast Pacific Ocean has suffered more or less from this difficulty of access.

The Suez Canal did much to improve this condition, but the penetration of the Panama Isthmus will undoubtedly have a more radical effect. The Panama Canal opens up lines of communication untouched by Suez, and probably affecting much more extensive areas, that must have a momentous effect on the tide of trade and emigration within a few years, especially under the upheaving influences of the war in Europe.

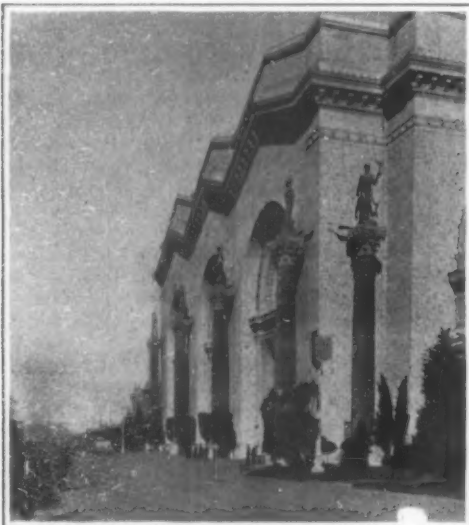
While the Canal brings these great territories into easy communication with the rest of the world its special influence upon conditions in the United States is more direct, and the results are tremendous in their possibilities, for the Canal puts us into closer touch with territories including one fifth of the land surface of the world, and a third of its population, than London or Hamburg, and the possible influence and benefits arising from such a connection are too vast to be understood or appreciated at the present time.

### Why the Exposition is a Fitting Way of Celebrating the Canal.

It is such a momentous event, far overshadowing the engineering and administrative triumphs of the actual work of construction, notable as these are, that the Panama-Pacific Fair is intended to celebrate and announce to all people, and apparently its organizers and creators accomplished their purpose and realized their ideals in a way that will be a credit to their country.

In planning the exposition it was decided to divide the buildings into three principal groups, massing the great exhibition palaces in the center, while the pavilions of the nations, and State buildings, lie to the west and the amusement section, the "Zone," is located nearest to the heart of San Francisco. The base of the central group is a great quadrangle composed of eight immense exhibition palaces, similar in character and separated by three great courts running north and

south between the three pairs. In the center is the vast Court of Honor, the Court of the Universe; on the west is the Court of the Four Seasons; on the east is the Court of Abundance. Huge colonnades screen the walls of the buildings, extending from the openings of the courts upon the harbor back to the courts themselves, and almost encircling them. The walls of these vast corridors are red, their vaults Venetian blue. Red, blue, green, and golden brown in pastel shades line the re-



Façade of the Palace of Machinery.

through the re-adjustment of the lines of commerce which it will compel, but fully as potently through the influences that result from the drawing together of great nations following improved facilities of communication.

Comparatively few people realize that the west coast

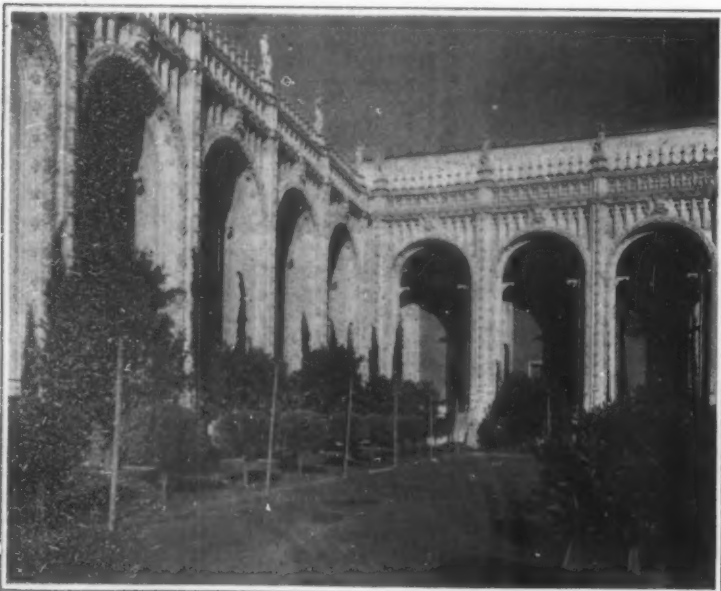
\* Illustrations of this article copyrighted by the Panama-Pacific International Exposition, 1915.



Vestibule of the Palace of Machinery.

cesses in the courts, silhouetting in color great groups of statuary placed within niches. Superb mural paintings by William DeL. Dodge, Frank Brangwyn, Milton H. Bancroft, Edward Simmons, and other famous artists will be placed upon the walls of the courts behind the colonnades or will ornament the vaults of great triumphal arches.

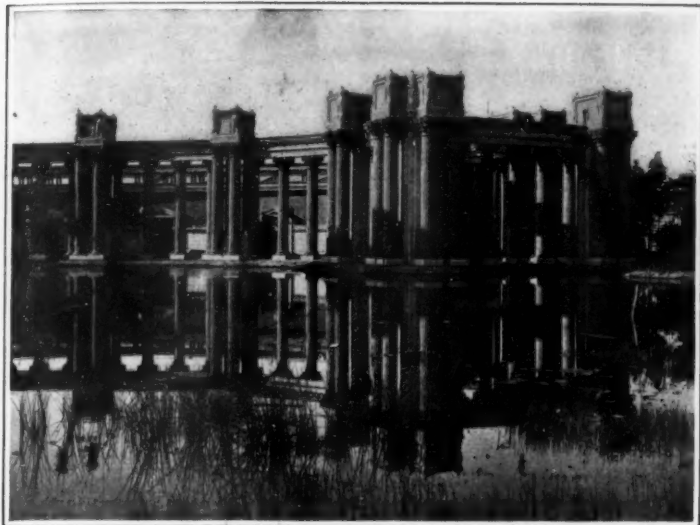
The huge domes rising from the center of eight of



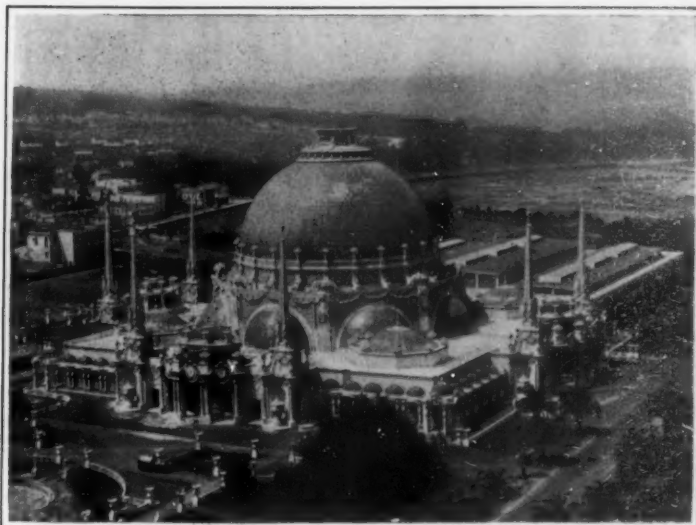
A corner in the Court of Abundance.



Unique half dome in the Court of the Four Seasons.



Exquisite colonnade of the Palace of Fine Arts.



The Palace of Horticulture with its beautiful dome.

the main exhibit palaces are their most conspicuous architectural feature. These domes rise 160 feet above the floors of the buildings, are 100 feet in diameter and are set upon great octagonal bases that rise at the intersections of transverse and longitudinal naves that run through the centers of the palaces. The lattices in the bases beneath the domes are of green with glints of gold showing between their intersections.

To the south of this group of buildings is the beautiful South Garden, flanked on one side by the wonderful Palace of Horticulture, with its Saracenic architecture suggested by the Mosque of Sultan Ahmed I; and on the other by the magnificent Festival Hall. To the west of the main group is the Palace of Fine Arts, a creation that well merits its name.

#### The Wonderful Tower of Jewels.

The central architectural feature of the grounds is the Tower of Jewels, a Babylonian effect that rises 435 feet high by a series of seven decorative terraces, and is surmounted by a triumphal group of figures supporting a globe, typifying the world. This is the work of Thomas Hastings of Carrere & Hastings, and suspended upon its walls are 125,000 "jewels" of cut glass that scintillate in the sun, and at night glisten and radiate multitudes of beams reflected from the many colored lights that are arranged to play upon the tower, as well as most of the other principal buildings. Through the base of this tower entrance is given to the Court of the Universe by an archway 125 feet in height, and set within a vast colonnade in its base are the two great fountains, the Fountain of El Dorado and the Fountain of Youth.

Contrary to general expectation, the architecture of the exposition buildings is not of the Mission style, but the prevailing character is rather the Italian Renaissance and Greco-Roman. There is, however, a flavor of Spanish architecture, but of the highly ornate High Renaissance Spanish style, and the Hispano-Moorish. Decorative detail has been used with a lavish hand, but also with taste and judgment, and days could be spent in studying and admiring these subordinate features alone. Upon the architectural effects and details the best thought of the country has been bestowed, and the results have surpassed anticipation.

The general character of great fairs has tended to settle into certain general lines, but in the case of the Panama-Pacific the richness and variety of the archi-

ture and the luxuriance of the decorative detail preclude all possibility of an impression of sameness, while a special feature of the decoration gives the exhibition as a whole a daring character of novelty and a beauty that is individual.

#### Not a "White City" but a City of Color and Beauty.

This special feature, that gives a startling beauty and brilliancy to the entire scene, is the introduction of color, not for an occasional contrast, but everywhere, and making the whole scene poly-chromatic. We know that the Greeks in their most beautiful creations did not rely on form alone for their effects, but used colors liberally, not only in their architectural work, but in their sculpture, and this is the plan adopted at San Francisco. Early in the preparation of the plans the management called in Jules Guerin. He has wrought on this six hundred and thirty-five acre canvas a harmonious picture, vivid in color and beauty. In contrast with other similar undertakings there are here none of the great familiar areas of white showing up on every side, for white has been entirely eliminated from the color scheme everywhere. In its place we have the marvelous blending of brilliant shades of red, orange, and blue with the green of the trees and shrubbery and the soft, warm buff of the walls of the buildings, for this shade has been adopted as the universal tint for

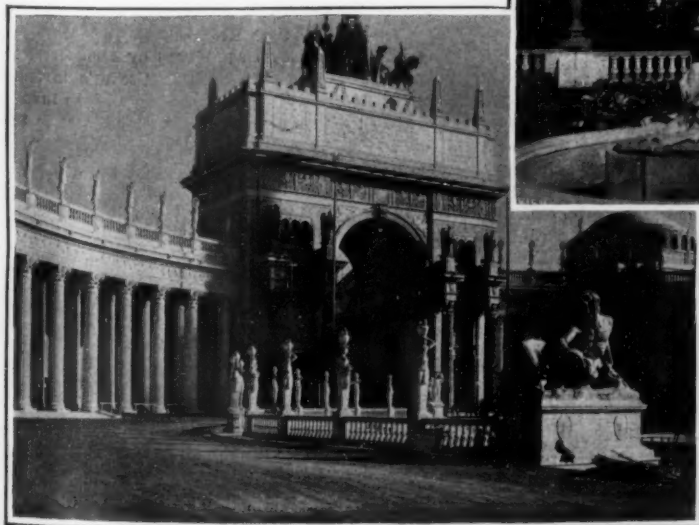
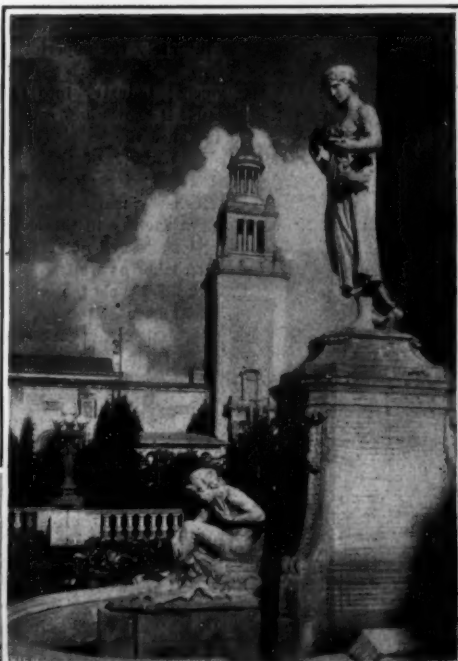
all of the large blank surfaces. The many domes are gold and copper green, while the roofs show in some places the old red Spanish tile, while others are cerulean blue. The capitals and friezes are picked out in gold, blue, and orange, while the colonnades show pleasing contrasts of warm buff against Pompeian red.

These colors are not applied as paints or stains, but as pigments mixed with the material of which the surfaces of the buildings are composed; and this is of the character of cement rather than of the once familiar "stucco," for which reason the colors are not as easily or as quickly affected by the weather. Furthermore, the surfaces have a natural stipple character that softens the color effects and eliminates all disturbing reflections. Cunningly arranged in the decorations of capitals, and in the flutings of columns, are numerous electric lights, which, with the many searchlights distributed about the grounds, illuminate the buildings at night and startlingly bring out their beauties.

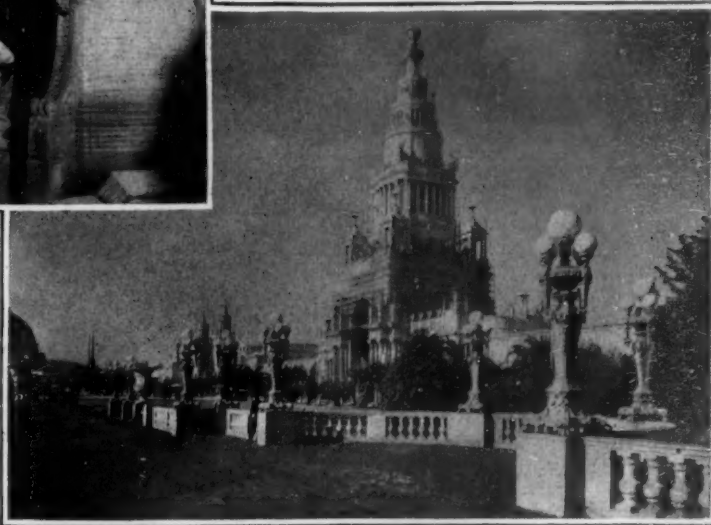
Sculpture is freely and effectively employed everywhere, and this branch of the decorative work was in charge of Karl Bitter and A. Sterling Calder, while the various notable works were created by many well-known artists. Monumental fountains are located in the various courts, and many spectacular groups are found surmounting the arches. Mural paintings, skillfully rendered in harmony with the general color scheme, have been appropriately located and distributed.

Considered as a whole this fair is an object lesson of the greatest value to every architect, artist, or other student or lover of the beautiful in color and form.

In its exhibits the great progress that has been made in every branch of art, science, manufacture, and industry should insure an array of novelties to satisfy the most exacting; and the management gives assurances that this is the case. Naturally the war has had its effects, but apparently this will not be appreciable, especially in view of the fact that even since the war started several of the nations involved have increased the appropriations made for the purposes of their displays, and even desolated Belgium will be represented by notable collections. This same is the general situation in regard to European countries generally; but irrespective of these the contributions of our South American neighbors and the displays from the Orient are probably sufficient to amply reward every visitor for his pilgrimage.



Arch of the Rising Sun with group "Nations of the East."



Fountain of the Festival Hall and the tower of the Court of Palms.

The Tower of Jewels covered with thousands of flashing crystals.

# Doing Without Europe—V

## Some Striking Instances of the Value of Research in Industry

WHEN one considers the opportunities that confront the American manufacturer and the ease with which many of the problems connected with the establishment of new industries in this country can be solved by industrial research, it is amazing indeed to discover how backward we have been. In the automobile and upper leather manufactures, for example, chromium is of great importance. Most of the ore comes from South Africa, Austria, and Russia. Who knows but a substitute may be found if a competent expert is employed to find it? Cyanide of potassium is made in Germany and is much used in gold mining and electroplating. The war has completely upset the industry. Who will be the first to employ an industrial research chemist to work out a process which will be profitable in America?

Ichthyol, a peculiar asphaltic material found in Austria, which finds application after appropriate chemical treatment as a very important medicament, has been cut off almost entirely. The raw material comes from a fossiliferous deposit near Seefeld, in the Austrian Tyrol. It is carefully selected and subjected to dry distillation. The distillate thus obtained is then sulphated and subsequently neutralized with ammonia. The use of this material has greatly increased in the last few years. Since the beginning of the war its price has doubled. Already a firm in St. Louis has a material on the market which has been favorably recommended as an efficient substitute closely resembling ichthyol itself.

Chemical glassware has gone up markedly in price since the war. There is nothing mysterious in the making of glass—at least there ought not to be. But our glass industry, with the exception of plate glass, is in a low condition. That is because it has never been scientifically conducted. Its processes are still based upon formulae handed down from father to son. Often as many as twenty-four different ingredients are mixed together to form a batch of glass-making material, notwithstanding the fact that, scientifically speaking, only four are required. In glass-making alone there is an enormous opportunity for industrial research since the war began.

There is one carbon that is manufactured in Europe that is superior to the American carbon, and that is the projector carbon used for moving-picture machines. The American manufacturer has not been able to produce a carbon which seems to be as satisfactory for the purpose as the German. The Speer Carbon Company of St. Marys, Pa., is conducting research which probably will produce a carbon that will ultimately compare very favorably with the equivalent European product.

### One Effect of Prohibition in Russia.

When Russia placed a ban upon vodka it little realized the industrial effect. Fusel oil is a by-product in the manufacture of vodka, and fusel oil is necessary in the making of lacquers. Hence, the lacquer supply at present in this country must be carefully guarded. Now, it happens that about two years ago the E. I. du Pont de Nemours Powder Company made a very careful and exhaustive study of the synthetic manufacture of amyl acetate and refined fusel oil, and succeeded in developing a process by which both of these materials can be made synthetically. Fusel oil is a by-product of the distillery, and in the past has been allowed actually to run to waste. Because of a corner engineered by a Russian syndicate, the price was greatly advanced two or three years ago; but there was no legitimate reason why the cost in this country should exceed \$25 to \$35 per 100 kilos. At this price it is not possible to compete with the synthetic article.

If we were to enumerate all the possibilities that have been opened up by the war, we would have to publish an article which would require page after page of the SCIENTIFIC AMERICAN. We do not advocate industrial research as a panacea for all our industrial ills; nor do we believe that it will answer the requirements of every manufacturer. On the other hand, it is safe to say that the helplessness of most business men in face of an industrial situation which is one of the severest that they have felt for many years could be removed if expert advice were sought.

### After the War—What?

It must not be forgotten that, if their plants are not damaged in the present war, German manufacturers will put forth the most strenuous efforts to regain their trade with outside markets. The loss which has been sustained by the interruption of their manufacturing operations must be recouped, and the United States with its low tariff would be a shining mark for these commercial attacks. What little headway we have made in foreign markets will probably also be lost; for

*This article is to be regarded as a direct continuation of that published in last week's issue of the SCIENTIFIC AMERICAN. Its object is to set forth the possibilities of industrial research not only in solving the industrial problems created by the war, but in enriching the country in a new way.—EDITOR.*

In foreign markets we have always been helpless when we met the competition of the Germans.

Now, the Germans' strongest asset is industrial research. The smallest German manufacturer knows how significant it has been in the upbuilding of Germany's industrial power. He knows exactly where he is weak, and proceeds to strengthen his business with the aid of the Material-Prüfungsamt of Gross-Lichterfelde, near Berlin, and of dozens of private institutions which are scattered throughout his native land. Apart from any patriotic desire to do without Europe, it will become vitally necessary to the American manufacturer to take more than a passing interest in industrial research if, after the war, a flood of German goods will inundate this market at prices even lower than those with which American manufacturers had to contend before.

Once the American begins to take a healthy interest in the scientific improvement of his manufacturing processes, we will find him as restless in that respect as he has been in developing the mechanical efficiency of his plant. He will change his whole attitude toward manufacturing.

### The Folly of Trade Secrets.

In the first place, he will care less about trade secrets than he now does. Even now the industry dependent on trade secrets is fast giving place to the industry that is scientifically conducted. The dye house of a textile mill is a case in point. There was a time when the master or "boss dyer" had a special knowledge which he guarded carefully. He was on close personal terms of intimacy with his several helpers, the most ambitious of whom ultimately and in turn became a "second hand" and was taught the principles of the trade—in reality, the "drugs" utilized and how prepared for dyeing. When Perkin discovered mauve, a new era dawned. The secrets of the dyers have given place to the great amount of practical technical data disseminated by the large color manufacturers. As a technically informed person, the dyer of to-day is infinitely the superior of the boss dyer of yesterday.

The introduction of the glucose industry into this country is also interesting because it shows how secrecy gave place to science. In a measure the industry was an imported one, as Mr. T. B. Wagner of the Corn Products Company once pointed out; for glucose had been made from potatoes in Germany many years before the establishment of the first factory in this country. In those early days it was necessary not only to import the machinery, but skilled labor as well. Among the most important were the men in charge of the vacuum pans. They were brought here at the expense of the manufacturer and engaged at extravagant salaries. They were quick to realize their advantage and soon became the bosses of the plant. They ruled absolutely. Their work was surrounded with great mystery, but it had to give way to efficiency, and to-day the position of a pan man is no more important than that of any other workman; in fact, unskilled men are often selected for this work and soon become experts at their post.

### Wealth from Waste.

In the reclamation of industrial wastes alone—the truest kind of conservation—an immense amount of profitable work remains to be accomplished. The glucose industry is an object lesson in that respect. One of the last by-products to be recovered in that industry was the so-called "steep water"—the water in which the corn is immersed and softened prior to grinding. In the words of Mr. T. B. Wagner: "It contains the most valuable ingredients of the grain, namely, the organic phosphorus compounds, magnesium and potash salts, nitrogenous bodies and sugars. Many efforts have been made to recover these solids in dry form, but owing to the hygroscopic condition of the residue, such methods were found to be impracticable. At one Iowa factory grinding about ten thousand bushels of corn per day, the steep water was run with the wash waters from starch and gluten into a creek, which in turn discharged into a river of fair size. This method of disposing of the steep water soon became a menace to the plant, and court suits were started against the factory, since the fish were killed and the residents were discomfited. The owner of the factory was compelled to

run a pipe line to a farm located about three miles from the factory. For that privilege, besides furnishing a most excellent fertilizing material, he had to pay the farmer \$3,000 annually. To-day this form of waste is recovered by collecting it, concentrating *in vacuo* and adding it to the gluten seed in the form of a syrup, with which it is subsequently dried, the seed acting as an absorbent. Instead of investing in pipe lines and paying for dumping rights, the waste of a 10,000-bushel plant was thereby converted into a revenue of almost \$100,000 a year. Applied to the industry as a whole, this form of waste furnishes to-day an annual gross income of approximately one and one half million dollars."

The utilization of waste lyes of industrial plants has always been a difficult problem. The question is pressing for cellulose plants working according to the sulphite process. The waste liquors of these plants contain, in addition to sulphurous acid, about 10 per cent of wood pulp in suspension, which has been simply allowed to run off with the waste water. Because of the sulphurous acid, the lye is biologically detrimental to water courses, and has given rise to damage suits as well as complaints. In addition, the air in the vicinity is badly contaminated.

In Sweden the waste liquors are used in the production of alcohol. In Germany this was not economical, and accordingly a process was developed in a Rhine plant for obtaining a useful solid product—a transparent, resin-like substance, which can be utilized as a binder in coal or metal briquetting, for which purpose it is said to have an advantage over coal tar pitch. At a plant in Bruckhausen, 18,000 tons of blast furnace dust are daily transformed into briquettes with this cellulose pitch.

### How Old Problems May Be Profitably Solved.

As far back as 1872 chemists had hinted that perhaps there were industrial uses for what they called "phenolic condensation products," which were modified forms of carbolic acid. But resin-like substances were formed in obtaining these phenolic condensation products, and no one knew what to do with them. Dr. L. H. Baekeland, a well-known industrial chemist, set to work and discovered how they could be controlled. From carbolic acid and formaldehyde, two ill-smelling substances, he produces an absolutely new compound—a solid, hard, infusible, insoluble compound which might easily be mistaken for amber or fine Chinese lacquer. Cigar holders, battleship switchboards, jewelry, acid-pump valves, brass bedstead lacquers, phonograph records, billiard balls, automobile magnetos, unbreakable dolls, newspaper stereotyping matrices, and much electrical machinery is made with his transformed carbolic acid. He has given America a new industry.

An equally notable solution of a technical problem which had long baffled other investigators is the Frasch process for refining the crude, sulphur-bearing Canadian and Ohio oils. The essence of the invention consists in distilling the different products of the fractional distillation of the crude oil with metallic oxides, especially oxide of copper, by which the sulphur is completely removed, while the oils distill over as odorless and sweet as from the best Pennsylvania oil. The copper sulphide is roasted to regenerate the copper. The invention had immense pecuniary value. It sent the production of the Ohio fields to 90,000 barrels a day, and the price of crude Ohio oil from 14 cents a barrel to \$1.

### The Money that Research Can Make.

The effects that may be produced by even slight improvements almost surpass belief. Gayley's invention of the dry air blast in the manufacture of iron involves a saving to the American people of \$15,000,000 to \$20,000,000 annually. A modern furnace consumes about 40,000 cubic feet of air per minute. Each grain of moisture per cubic foot represents one gallon of water per hour for each 1,000 cubic feet entering per minute. In the Pittsburgh district the moisture varies from 1.3 grains in February to 5.94 grains in June, and the water per hour entering a furnace varies, accordingly, from 73 to 237 gallons. In a month a furnace using natural air received 164,500 gallons of water, whereas with the dry blast it received only 25,524 gallons. A conservative statement, according to Prof. Chandler, is that the invention results in a 10 per cent increase in output and a 10 per cent saving in fuel. It has been estimated by a well-known research electric engineer that the metallurgical improvements in transformer steels, brought about within the last few years by modern metallurgical research, represent a saving in money which would amount, if capitalized at 6 per cent, to approximately \$15,000,000, is the experience of one great manufacturing corporation alone.

# The Government Ship Purchase Bill—II

## The Fallacies of the Administration's Policy

By Senator Theodore E. Burton

**D**URING all the lengthy and momentous period during which I have been privileged to be a member of the Senate, I cannot recall any proposed legislation, which, having regard to its great importance and far-reaching consequences, was so hastily conceived and ill-begotten as the Ship Purchase Bill of the present Administration. The very first reading of the bill brings up a dozen questions to not one of which is a satisfactory answer given or even suggested.

First of all is this policy to be permanent or is it to be temporary? If it is to be temporary one set of reasons would apply. If it is to be permanent another line of policy should be adopted. I find that the statements of the sponsors of the bill on this phase of the subject are at variance. Thus, in an address at Boston, the chairman of the House Committee, Mr. Alexander, said: "The Government ownership bill is spoken of as an emergency measure. It should not be so called. European governments have in the past laid the foundations of their merchant marine by government protection." Yet on the previous day, Senator Fletcher bringing forward this bill in the United States Senate said: "Without going further into the details of this bill, I assure the Senate in the first place, and the country, that it is not a permanent business undertaking of the Government that is intended here." And yet again, the President in his message in December said: "It is not a question of the Government monopolizing the field. It should take action to make it certain that transportation at reasonable rates will be promptly afforded, even where the carriage is not at first profitable, and then, when the carriage has become sufficiently profitable to attract and engage private capital and engage it in abundance, the Government ought to withdraw." Now here we have two distinctly contradictory statements. Which are we to take as authoritative?

Is this to be an enterprise for profit or not for profit? Is it supposed that by running at a loss for a period, in some mysterious way the business would become profitable as implied in the President's message and that the Government would then be able and willing to turn it over to private hands? It is self-evident that such a supposition is without any foundation in reason. The sure results of the Government operating merchant ships at a loss will be the complete demoralization of the shipping trade, the destruction of such merchant marine as we now have, and a long postponement of the day of its revival. Furthermore, when the measure was first brought forward, it seemed that what was under consideration was trade development in South and Central America; new avenues of trade, "empty markets" to use the expression of the President, "were the objects in view." Now there is an entire change and the advocacy of the bill is based upon the necessity of sending freight to Europe.

Now what are the facts with regard to this South American trade? We find that ten boats leave every month on the average from New York for Rio de Janeiro on the east coast of South America. Before and since the war they have been running with a surplus of cargo space, sometimes being only half-filled. On the west coast of South America, notwithstanding the stimulus afforded by the opening of the Panama Canal, the Peruvian and Chilean Navigation Companies, which jointly ran boats weekly, have withdrawn the weekly service and made it fortnightly.

I am sorry to say that there are a great many people in the United States who do not seem to realize that we are in the midst of the most titanic conflict between nations that the world has ever seen. We should have a deep realization of what it means. Certainly we should not at this time allow fondness for the enlargement of trade—a disposition with which I sympathize—to erase from our minds a realization of what this war means and of the duty of the American people. I want the American people to realize this fact: There is war, and this war has deranged the routes of trade. It has destroyed many of the agents of transportation. It has diminished shipping facilities. It has introduced demoralization, partial destruction, in almost every branch of commercial and industrial activity. We must not ignore that fact. Certainly we must not treat this question as if it was one to be settled as if we were now at peace.

Will the conditions of European trade be relieved by increased shipping? Do not let us deal with generalities. Let us get down to the facts. What is it that has caused this decrease in the supply of shipping and an increase in freight rates? In the first place German and Austrian shipping, carrying probably about 14 per cent of the foreign trade, is withdrawn from the seas. But let us consider that for a moment. If German and Austrian

shipping is withdrawn, so also are Germany and Austria shut off from the trade of the world. The Baltic Sea and the Black Sea are both practically closed to trade; and roughly approximating an estimate we may say that the trade of the world has decreased because of the war in just about a like proportion to the decrease of available shipping.

Another factor of great importance is the liability of boats to search and seizure. Still more important is the cost of war risk insurance. Another factor is the dangerous channels through which shipping may go, confronted as it is by the fearful menace of the high explosive mine; and yet another factor is the requisition, especially by Great Britain, of a good share of its shipping to be used for military purposes. Finally and most decisive of all elements in the situation is the delay in foreign ports due to congestion.

Regarding this last condition, a man said a few days ago—and I am not sure but that he was pretty nearly right—the provision of more ships would add to the congestion, for they are all at present in each others' way in foreign ports. By way of illustration I mention the case of an American boat chartered to carry horses to a port in France, which had an additional cargo capacity of 8,000 tons dead weight. Upon the owner's learning that in the port to which they were going there had been a delay of 60 days in loading and unloading, he dispatched the ship without filling a foot of the space, rather than take the risk of delay and detention. A few days ago 30 ships were waiting in vain at Genoa to be unloaded. There is similar congestion at Liverpool and London. It is evident that should the Government purchase \$40,000,000 worth of shipping to be used in the trans-Atlantic trade (and this as I have shown is the latest proposition of the Administration) these vessels must be subjected to all the disabilities incident to the present disturbed condition occasioned by the war, to which I have referred above.

But where is the Government going to obtain its ships? A leading shipping authority who has been quoted by the Secretary of the Treasury says that there are not more than ten ships available under neutral flags that would be suitable for the purpose, and he therefore advises the building of new ships. Very good; but we are told that it is a "present emergency" that is upon us. Nevertheless we all hope that this war will close in less time than ships could be built. Most of our shipyards are busy already and it would be 10 to 16 months before a boat of any considerable size, suitable for trans-Atlantic trade, could be built in one of our shipyards. In the meantime we have those ten ships. What is the Government going to do with them? What better would the Government do with those ten ships than the private owners are now doing? Is the Government, which we must concede is sometimes very unwieldy, going to manage the shipping business better than the private owners?

Although Government ownership has not the terror for me that it has for many, it must be borne in mind that in the proposed bill it is partial Government ownership which is advocated, although there is nothing surely more disastrous than to have part Government and part private ownership. This is not a fair test of Government ownership and operation. Furthermore, the ships purchased with \$40,000,000 would be a mere bagatelle in the shipping of the world. Even if it were half the world's shipping, the country would be in about the same condition as the citizens are when there are two telephone lines in their city. We have all heard the statement, "You have one telephone line here. If you put in another you will have the benefit of competition." We are all familiar with the results; separate wiring in each building; separate conduits in each street, two telephones in each office; inconvenience all along the line, and finally either insufficient service, or the public has to pay the interest on both systems.

Supposing that this Government-private corporation scheme possesses itself of one fourteenth or one twentieth of the shipping of the world. What is to be its policy of operation? Will special ports be selected? If Galveston is chosen, will not Mobile and New Orleans complain? If a special product such as wheat or cotton is chosen as freight, every other class of producer will complain that the Government is giving a special advantage to this line of business. Suppose the Government carries at lower freight rates than private owners. What would be the result then? Simply that one twentieth of the traffic of this country—certainly not more than one tenth—will be carried at a lower rate. What is the result? Does the great body of the American people get the benefit of it? No. It is the few who are benefited by those

rates. It is impossible for the Government or for anyone to go into this shipping business partially and make a success of it. If the country is to go into Government ownership it is necessary that the United States shall control the whole business. There is no middle ground.

I fear that there is no general recognition in Congress or outside of it of the fact that the shipping business is one of the most complicated and difficult of all industrial activities; and that it calls for long experience and a thorough acquaintance with the conditions on the part of those who wish to enter the field with any hope of successful competition. I recognize the disposition on the part of many of the American people to disparage expert knowledge. It is thought that inexperienced men may gather round the table and smoke cigars and make plans and devise organizations for the trade or industry just as well as those who have given their lives to it.

Now the shipping trade has been developing for centuries. It has adopted new routes of trade, new methods. There are certain necessities in regard to it. There must be terminals for the loading and discharge of freight. It is not sufficient to have ships; there must be wharves and piers. Is the Government going to secure these also? There must be affiliation with shippers; is the Government going to secure such in a month or two months? There must be a familiarity with the routes of commerce. A most careful calculation must be made so that the ship will not only have an outgoing but a return cargo; that she shall have something to do the year around.

Then there is that serious question of the purchase of the ships of belligerent nations. The doctrine of the continent of Europe is that the transfer of a belligerent ship to neutral flag in time of war is void, and that if she sails with the neutral flag, she can be seized, taken into the prize courts and condemned. This continental doctrine was agreed upon by all the commercial nations, practically, in convention in London in 1909. With all these belligerents united in the idea that ships cannot be transferred under these circumstances, I want to state that we cannot afford to take the chance, particularly if it is borne in mind that no nation has insisted upon the rights of belligerents more earnestly than we did in the civil war. And just here it cannot be too strongly emphasized that this is not a private enterprise. Instead of buying the boats directly the Government is to organize a corporation, 51 per cent of the stock of which is to be paid directly from the Treasury, and if the remaining 49 per cent is not taken by private subscription then the Government takes that also. The Secretary of the Treasury and the Secretary of Commerce exercise certain supervision over this corporation with three others who constitute a shipping board. We have been informed that the President is to have control of this enterprise. But what I ask is, How is that policy consistent with private business of a private corporation? The fact of the matter is that this corporation is a mere mask. It is a Federal enterprise. Now a citizen can ship munitions of war to a belligerent and the Government is not compelled to intervene. If the citizen's boat is caught, he loses that which is contraband in his cargo; but the moment the Government of the United States does a thing of that kind, it is an act of hostility leading to the most serious complications. You cannot get out of that situation by passing a bill of this kind and going through the fiction of organizing a corporation of the District of Columbia.

It is simply preposterous to believe that a Government Board entering into this business without affiliation with the shippers, without wharves and docks, can utilize those boats and carry any more freight on them than the private citizen who has made it a business all his life. The scheme is foredoomed to failure by the very economic necessities of the case, and if it should be once set afloat and include the purchase of belligerent ships, the United States will be very fortunate indeed, if in addition to a pitiable financial failure, it does not find itself with a serious international quarrel upon its hands. I should tremble with apprehension if this corporation should be organized, and the boats owned by it, under the direction of the Government, or as Secretary McAdoo has said, under the general direction of the President of the United States, should go out to sea and be seized by England or Germany on the ground that the cargo was contraband or that the ship had been transferred to our flag by a belligerent in time of war. I for one certainly do not want such a bone of contention, such a source of friction and quarrel brought into our international relations at this time, when everything is so tense

(Concluded on page 204.)



Copyright by International News Service

In the advanced trenches at Vera Cruz.

AT the end of the Civil War we had, North and South, about three million effectives who had seen actual military service. In other words, we had a splendid unorganized reserve, out of which first-class armies could have been made on short notice; we had a very strong navy, and immense reserves of guns and other munitions of war. All these men have gone. The guns are obsolete, and we are now, with greatly increased responsibilities, absolutely without reserves, and with a regular army and militia which are, in effect, only a handful of men.

#### False Estimates of Our Military Prowess.

We have never had war with a first-class power prepared for war, which we have fought unaided. During the Revolution, the English opinion concerning us was divided, and at a critical stage of the war we had the invaluable assistance of France. In the War of 1812 England was engaged in the death grapple with Napoleon, and the largest number of British regular troops in this country at any one time was about 16,800. In fact, from the military standpoint, we were a side issue. England's energy and effort were concentrated against Napoleon. While we had individual, brilliant, single-ship actions at sea, at the end of the war such ships of war as we had afloat were under blockade, our coastwise commerce practically destroyed, and our commerce on the high seas suspended. We were almost universally unsuccessful on land up to the Battle of New Orleans, where for the first time the British met a foe skilled in the use of the rifle and men many of whom had been under fire.

#### Moral of the Loss of the Capitol in 1812.

We put into this war 527,000 different men; we abandoned our capital to a force little more than one half that of the defenders, with a loss of eight killed and eleven wounded, and this at a time when nearly every American was familiar with arms and knew how to take care of himself in camp and field. It should also be noted that the force defending the capitol was made up largely of troops drawn from sections which had furnished some of the best troops of the continental

armies. The reason for failure and general defeat on land was because we trusted to untrained, raw levies, men utterly unprepared to meet well-trained troops. The nation was responsible, and showed that it had learned little from the experience of the past and that it was fairly entitled to the criticism of Light Horse Harry Lee, who said in effect, "That nation is a murderer of its people who sends them unprepared and untrained to meet in war men mechanized and disciplined by training."

#### We Were Unprepared and Untrained in 1812, and, Relatively, We Are Even Worse Prepared To-day.

The people of 1812 were unprepared and untrained. To-day we are not only unprepared, but are absolutely ignorant of the use of arms; the population has a large percentage of newcomers, who are not deeply interested in our institutions; the possibility of war is many times greater than hitherto; and the nations whom we have to fear are always ready. We are, relatively speaking, less ready than ever before.

The days of small standing armies, of slow preparation, and of still slower transportation have passed. The possible enemies of to-day are fully prepared. They control almost unlimited transport, and once in possession of sea control can land when and where they wish, certain that no well-organized or thoroughly equipped force will be ready to oppose them. The weakness of our military establishment, our total lack of reserves, or trained men, or of adequate reserves of material, are known to the last detail by all our possible antagonists, some of whom have more thoroughly trained reservists in this country than we have immediately available mobile army and efficient militia combined. This is true of both seaboard and for the country as a whole.

#### What Australia and Switzerland Have Accomplished.

The solution of our difficulties will be found in the establishment throughout the country of a system of military instructions on the general lines of that which is in force in Switzerland or Australia. Switzerland, with a small population, is able to put 220,000 men in the field in two days and to follow it with nearly

## IV—The United States and U

The Lesson That Hist

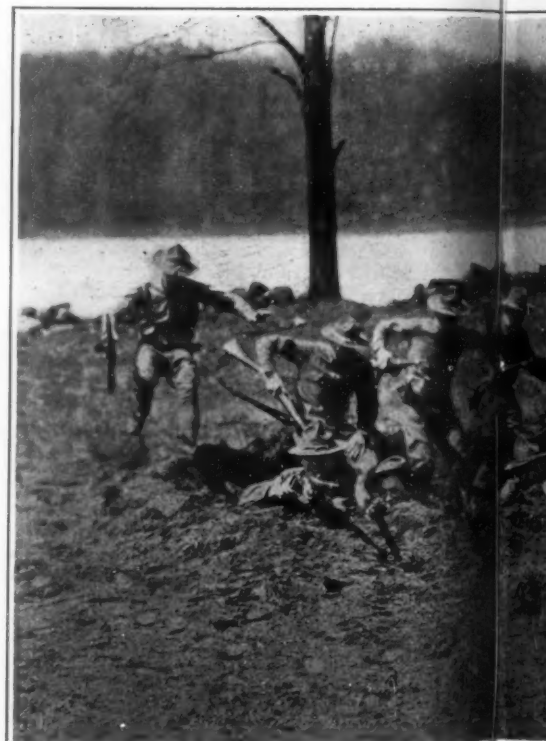


[The peril of invasion, the necessity for being prepared to meet and repel it, the certainty of overwhelming national disaster and disgrace if we stay as we are, are immeasurably greater to-day than when Washington, Adams, and Jefferson urged upon the United States the necessity for maintaining armed forces for the protection of the country. In those days war gave ample notice of

its coming, and there were provisions to meet its possibility. To-day war falls like a blow from heaven and the first blow is the first.

For a nation which, in our day, is unprepared, a modern war is a disaster. Every soldier must be

300,000 more in a week, and she has accomplished this through the operation of a system which has cost her only a little over \$6,500,000 a year. The effect of this training has been generally beneficial both upon the



Copyright by Underwood &amp; Underwood

A rush forward man a

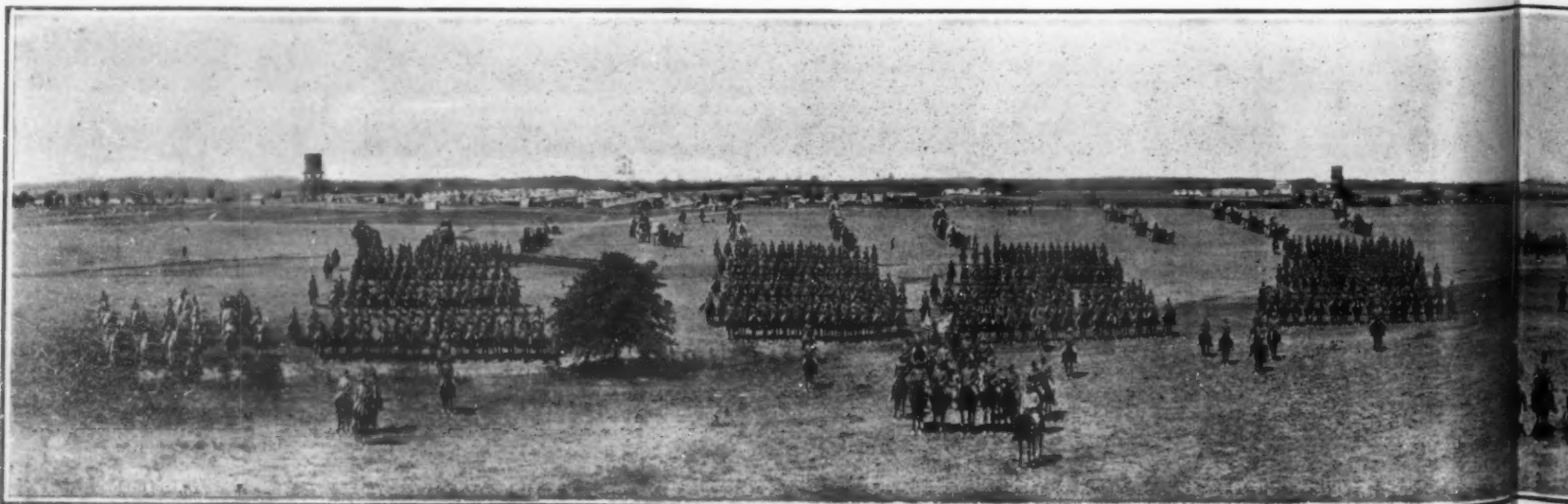


Photo. by Harry Winchester

A CAVALRY BRIGADE—THE CAVALRY

# an Undefended Treasure Land

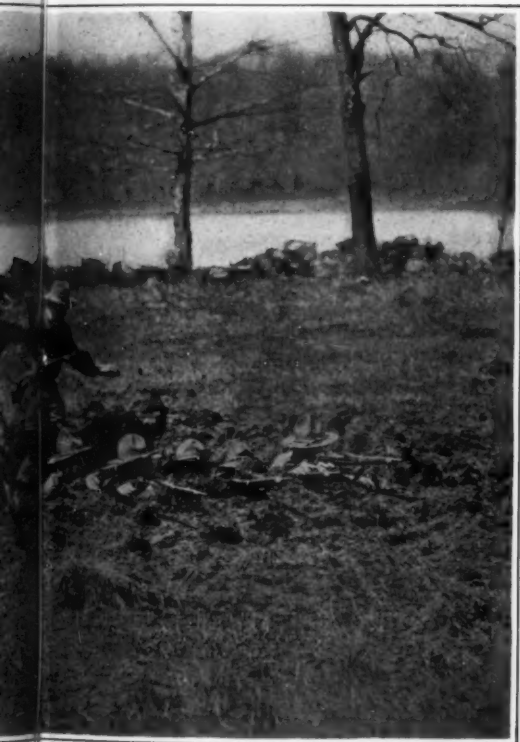
History Teaches



here we time to make emergency  
at its usually accumulating pres-  
ar falls like a thunderbolt from  
first line is often the decisive  
which, in our own, is totally un-  
ers were won almost before it  
sole warning uttered in the

preceding, and in this the final chapter of this  
series, is based upon absolute facts, and he who  
tells this country that an effective army of defense  
can be raised between sun and sun is his country's  
worst enemy. The words of Washington are as  
true to-day as when they were spoken: "To be pre-  
pared for war is one of the most effectual means  
of preserving peace."—EDITOR.]

physical well-being and economic efficiency of the indi-  
viduals affected, and has increased their respect for law  
and order, as shown by the comparatively low criminal  
rate and the orderly character of the people.



ward man a trench.



Photo. by International News Service

Entrenched troops repelling an attack.

## The Reservist Would Patriotically Answer the Call to Arms.

There has been a great deal of opposition to a reserve in this country on the ground that we shall be unable to keep track of the men. People seem to think that the American reservist is going to be a type of shirk, who will be skulking and hiding when needed for military service. Of course, if this is true, the country will be largely defenseless in time of war; but it is not true. We shall have no more difficulty than other nations have. Their reservists have gone back to the great war by tens of thousands, and done so voluntarily, as they were quite outside the reach of their country's authority.

A system of general instructions in the schools, such as is in force in Australia and Switzerland, will result in an increased sense of responsibility on the part of the individual toward the State and the gradual doing away with the idea that, while we all pay the routine taxes of every-day life, we are not under any obligation to pay the tax on which all others depend, namely, the tax represented by service in war. All history indicates clearly that when the citizens of a nation fail to recognize and pay this tax, the life of the nation is run.

## The Immediate Military Requirements for the Defense of the Country.

To sum up briefly what we need: First, are the new organizations for the regular army as shown in the table of organization of the land forces prepared by the general staff; the necessary field artillery guns and ammunition and other reserve equipment. Second, an adequate reserve behind the regular army. Third, the artillery and cavalry organizations, field artillery guns, ammunition and reserve supplies for the militia and the reserve of men in a word a properly balanced militia, with its reserve of men and material. Fourth, a great number of men trained to be officers of volunteers. Fifth, a gradual building up of trained enlisted personnel for volunteer organizations, at least sufficient to supply the coast guard troops above referred to and the additional troops needed to bring the combined reg-

ular army and militia when at war strength up to a force of at least 500,000.

## Modern Wars Are Brief, and We Cannot Prepare for War When War Is On.

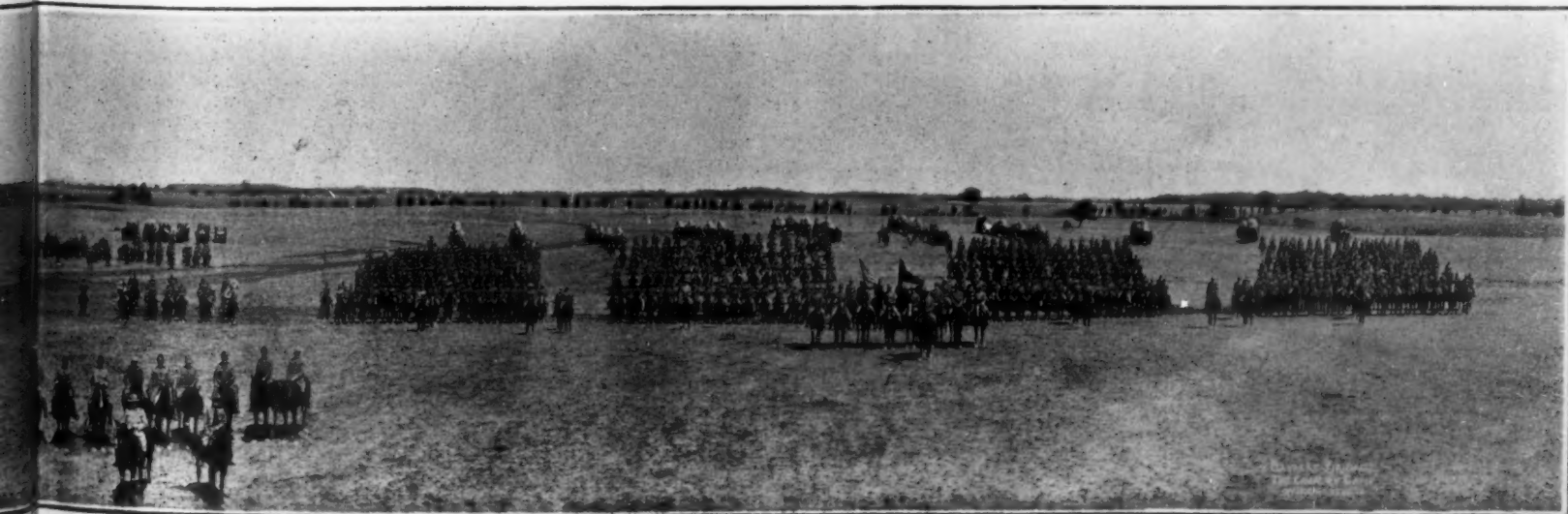
Unless we take to heart the lesson so clearly indicated by the experience of others and prepare in time of peace all this will have to be done, when war comes, in the hurry and confusion of war, and it will be accomplished at a frightful cost of life and treasure and with great attendant humiliation; for this country is not prepared and cannot defend itself successfully against any well-organized force of reasonable strength, landing on its shores, without such loss and delay as would be gravely disastrous. Such a force will take and hold until we can organize and build up a sufficient military establishment to drive it out of any area it chooses to occupy. Idle talk and boasting will have no effect upon its operations.

We should strive to establish throughout the Republic a universal system of military instructions through the public schools on the general lines now in force in Australia or Switzerland. Such a system will be in every way beneficial. It will make the American youth a better citizen physically, morally, and from a patriotic standpoint. It will also greatly increase his economic efficiency through the habits of regularity and promptness, which characterize military training. He will learn to respect the laws, the constituted authorities and the flag of his country. The system of reserves can be maintained very economically and, once established, both militia and regular army can be kept, in time of peace, at the lowest strength consistent with the needs of the hour, because they can be promptly filled up. We can maintain ten reservists for the regular establishment for the cost of one man on the active list. This proportion may not hold good for the militia, but still the militia reservist will be much cheaper to the State than the man who is on the active list of the militia.

## The Utterly Vicious Bounty System.

We must never again depend upon the bounty system.

(Concluded on page 204.)



THE CALVY CAMP, WINCHESTER, VA.

## An Electric Shriek to Warn Mariners

By Our Paris Correspondent

A NEW apparatus which is likely to be of great service in signaling between vessels at sea is the Blériot air siren. It being operated by an electric motor, while the sounds are produced in the shape of Morse signals by an electromagnet device. It will serve mainly for making connection between warships or even submarines when in more or less compact groups, and will be valuable for transmitting orders, for it can be distinctly heard at a distance of at least  $1\frac{1}{2}$  miles. More reliable than optical signals, for it works in all weathers, it is considered as more practical than wireless telegraphy for this class of short distance operating. The French navy is interested in the matter, and is now engaged upon official trials with a view of adopting it upon battleships. Placed on the top of the mast, the sounds will carry at sea under the best conditions.

Referring to the general view of the apparatus, and also to the section, the siren is designed to produce sounds on the usual principle of an air or steam siren in which the air is propelled through a rotating disk or cylinder working against a fixed one, both containing sets of openings, so that by means of the fixed and movable holes, the air comes out in intermittent jets or impulses, and as the movement is very rapid, owing to the high speed of the revolving piece, such impulses go to form an audible note such as is heard, for instance, on an automobile siren. By varying the speed of the revolving part, low or high notes can be emitted. The Blériot device uses the same principle, but is designed to secure a very powerful sound which will carry for  $1\frac{1}{2}$  miles or more. At the top of the device will be seen the portion which carries a set of holes for the passage of the air, and within it rotates a corresponding perforated cylinder so that the air leaves by the sets of holes, in fixed and revolving parts, on the siren principle. What is now desired is to obtain a powerful current of air, such as is needed to produce a very loud sound. This is done by the use of three separate rotary blowers which lie in the three flat chambers seen just below the siren proper and act on the three-stage principle to produce a powerful current. Below these chambers is a set of holes for admitting air. The bottom square part of the device contains an electric motor of upright kind, and the shaft of the motor runs clear up to the top of the apparatus, carrying the three air blowers as well as the rotating cylinder of the siren proper. Thus siren and blowers are all rotated by the same motor.

An ingenious principle is employed here in order to produce a very strong air current for the siren, and, as will be seen in the section, each blower or flat blast fan works inside its chamber in such a way as to take in air at the middle next the shaft and to drive it to the edge by the use of sets of blades as in the usual blast fans, so that the air leaves the edge of the fan at a high rate of speed. The blades are so designed that this speed is higher than that of the rotating blower itself. But above the blower and inside the chamber is mounted a set of fixed blades or wings, so that the air passes up from the edge of the blower and through the fixed wings before it reaches the center space next the shaft. By this means the speed of the air is transformed to pressure. Then the air enters the second blower, and so on to the top, so that when entering the siren the air has a high pressure due to these combined effects. Speed of the motor is 5,000 revolutions per minute. It remains to be able to form the Morse signals by cutting off the air when needed. Between cylinder and outside part is a rotating sleeve which takes

the form of a cylinder with holes corresponding to the foregoing. It works to and fro, and serves as a shutter to stop off the air or allow it to pass. Moving the shutter so that its holes correspond with the outside holes, the air can escape, but when the solid parts come opposite, the holes are closed off. At the top is a magnet device for working the shutter so as to operate it by a Morse key. Were the shutter coupled momentarily to the rotating key, it would be drawn forward by friction to the limit of its stroke, then releasing it would allow a spring to bring back the shutter to the off position. This coupling is done by the use of a rod with a small cork washer, which serves as a "clutch" in order to couple the shutter to the rotating cylinder when the rod is lowered, so that the washer touches the inside of the

commodations of a hotel considered necessary. This uniquely equipped automobile consists of a standard chassis fitted with a special body designed under the personal supervision of the owner, H. M. Butts. There is not an inch of space wasted, yet with the baggage, camping supplies and passengers, the machine is not crowded.

On the top the extra tires are carried in heavy cases. There is a compartment behind the back seats in which clothing is hung, as in a closet, and suit cases are stored. The bedding is carried in neat rolls inside the top. The seats make down like a Pullman berth, and there are compartments just above the rear seat where guns, fishing tackle, and other equipment are stored, with pillows and cushions packed in on top. Under the seats four steel rods and two wide strips of canvas are carried. These rods fit into concealed sockets on the side of the car and two sleeping hammocks are swung on outriggers. The side curtains are of extra length, and these buckle down over the guy straps, providing a good shelter.

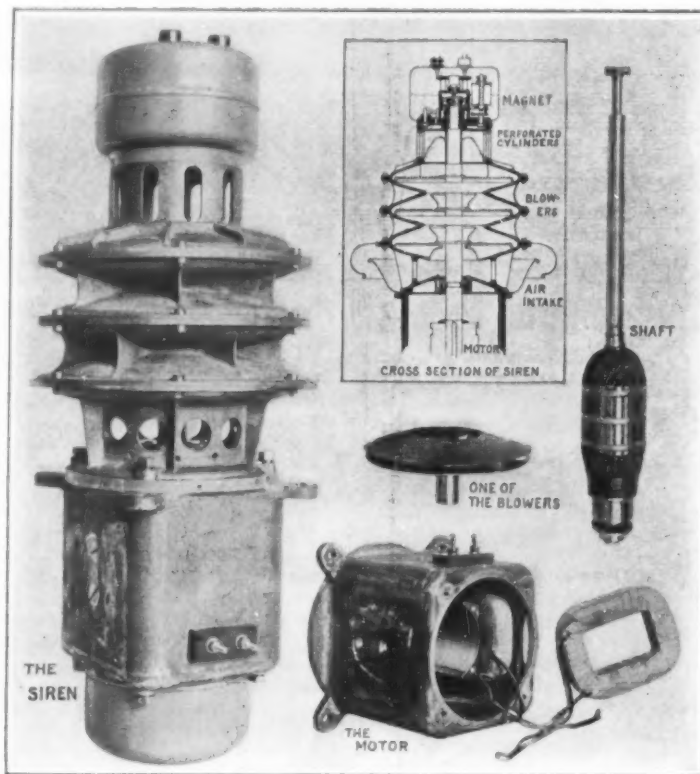
Several planks, rather heavy, are strapped on the right running board, which are convertible into a table on the rear of the car or into a bed, as the occasion requires. There is also a frame which is anchored into the ground with drive pins, and on this it is but a matter of a few minutes to make a comfortable double bed.

With the two side beds, or hammocks, the double bed on the running board, and room for three in the berth inside the car, seven persons are provided with comfortable sleeping quarters. It requires but a very few minutes to transpose the car of the road into a complete camp for the night.

The car is electric-lighted throughout. In every place conceivable there are small compartments for various necessary articles, and the curtains, besides being utilized for covering the hammocks at night, offer protection from rainy, windy, or extreme hot weather while traveling.

## The Current Supplement

IN THE CURRENT SCIENTIFIC AMERICAN SUPPLEMENT, No. 2043, for February 27th, 1915, an article on Roman Techniques and Industry in Early Germany describes a condition of affairs similar to those claimed to exist at the present time between Germany and her neighbors, and suggests the origin of many of Germany's industries. Biochemical Systems and Their Functions in the Development of Organism deals with important questions of internal functions influencing natural selection. A Physiological Puzzle discusses curious cases of hypnosis and catalepsy in insects, animals, etc., and is of intense interest to all engaged in biological study. The Spinning of a Web describes, step by step, the actual construction of a spider web, showing the wonderful engineering instincts of the insect. A beautiful series of illustrations accompany the article. Standardizing the Art of Voice Production deals with the fundamental principles, and the recommendations of the recent New York State Vocal Congress. The Chemistry of the Incandescent Gas Mantle tells of the principles and the processes in the making of this familiar light. The Artificial Production of Pearls tells how the Orientals induce the oyster to work according to their wishes. Color Photography reviews the history of this branch of photographic art, and describes modern methods. The article on treating gas from furnaces is concluded, and there is a good practical description of how to make a complete Oxy-Acetylene Welding Outfit. There is a page of notices of new and valuable books recently published, together with a number of short, but interesting notes.



Electric siren for marine use.

shutter and the flat top of the cylinder at the same time. This rod is worked by the magnet, so that the usual operator's key can produce Morse signals from the siren. Official tests were made with the apparatus before a technical commission from the French navy, and it was found that even under unfavorable conditions of wind and position of the siren, the signals could be taken down anywhere within a radius of  $1\frac{1}{2}$  miles using low, middle, and high notes. After using it on land, further tests were made at sea, with equally good results.

## Equipping the Automobile for Travel

By Charles Alma Byers

THERE have been many suggestions made for equipping the automobile for extensive travel, but probably one of the neatest, most complete, and most practical arrangements ever devised for such purpose is shown in the accompanying photographs. This is truly a touring car *de luxe*. And more than that, it has been put to a thorough test, having recently completed a trip of approximately 1,000 miles, extending from Denver to Los Angeles. It made this trip over what is known as the Santa Fe-Grand Canyon-Needles route, carrying a total of seven passengers. Fifteen days were required for the trip, stops having been made at various points along the scenic route, and at no time were the ac-

commodations of a hotel considered necessary. This uniquely equipped automobile consists of a standard chassis fitted with a special body designed under the personal supervision of the owner, H. M. Butts. There is not an inch of space wasted, yet with the baggage, camping supplies and passengers, the machine is not crowded.



Cabinet containing clothes and suit cases.



Appearance of the car when ready for the road.



One of the side hammocks in use.



Bringing in the victim, the team equipped with oxygen helmets.



Giving artificial respiration for two minutes was one of the requirements.

#### Mine rescue contests at the University of Washington.

##### Mine Rescue Contests

IN the State of Washington a team of miners equipped with oxygen helmets represents the town in the State-wide contests that have of late years become an annual affair. The last First Aid and Mine Rescue Contest was staged on the campus of the University of Washington, Seattle, and prizes were given to the winning teams.

A large dummy mine shaft was built before the convention and the various teams brought their own equipment for the contests. Six events were held on each of two days. In the team events, each town or mine was represented by six men: a captain, four men to do the actual work, and a man to represent the victim, who was obliged to submit to bandaging and artificial respiration for two minutes. Arms, legs, back, and face were bound up after the "rescue" while the pulmotor was being applied, and the team that fulfilled the requirements in the shortest time won the event.

An exhibition was given to show how a rescue team would work under special circumstances. A man was slid into the dummy shaft and rescued, the team pretending that he had gone in too soon after a shot and had been overcome by fumes from the exploded powder. Another event was the rescue of the man during a shaft fire. Before the team could leave in good order it was necessary to seal up the burning shaft. The United States Bureau of Mines supervised the contests.

#### How to Use the Scientific American

A TEACHER of chemistry in a Minneapolis high school has found good use for the SCIENTIFIC AMERICAN in her classes. The accompanying photograph of the front of her recitation room shows how she preserves and uses "some of the great amount of helpful material the SCIENTIFIC AMERICAN gives for high school work in chemistry."

The exhibits above the blackboard are, from left to right:

1. Dr. Wiley.
2. Chart showing derivation of the chief chemicals and manufactured products from the raw materials.
3. Water gas. (From the SCIENTIFIC AMERICAN.)
4. Coal gas. (From the SCIENTIFIC AMERICAN.)
5. Drawing the charge. (From the SCIENTIFIC AMERICAN.)
6. Tin model of "purifying box used" in making coal gas.
7. The equatorial. (From the SCIENTIFIC AMERICAN.)
8. Polar star trails. (Photograph by a senior boy.)
9. Charcoal from sugar.
10. A gaudy toilet soap—a souvenir of a visit to a factory.
11. A silvered mirror—laboratory work. All of

these stay in front of the class all of the time, and credit is given the source as each is taken down and used.

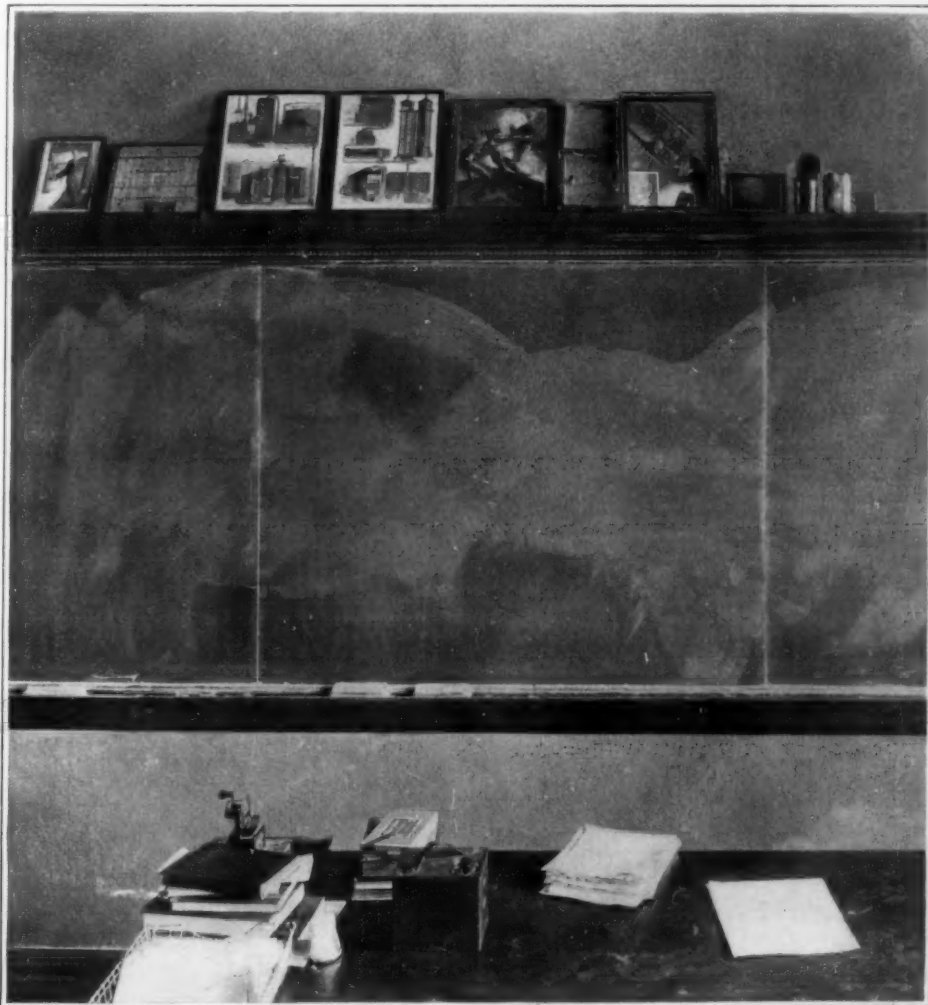
Lantern slides have been made of Nos. 3 and 4, and these two form the basis of a 45-minute lecture to each of four classes each semester—a summary of previous discussion—a final preparation for the visit to the gas plant.

#### Constructing Selenium Cells

WE have already given a few practical hints about preparing a base for selenium cells from slate or other material, and would now say a word about how to wind the base with platinum wire. Constructors who make a business of producing selenium cells will not employ any other metal than platinum, as other metals are said to be affected by the contact with selenium. This will, of course, alter the electric resistance and make the cell variable with time and generally bad, while with platinum no such effect is seen, as is besides attested by the brightness of the platinum, while copper when removed from contact with selenium, is seen to have a black surface. In procuring platinum wire, care should be taken that it is reeled off upon a spool, and not wound off as one would naturally do by hand, for this results in twisting the wire at each turn, and it

thus has weak places which are almost sure to break afterward, to the great detriment of the work. The same holds good in winding it off from one spool to another by the amateur. A good method of handling is to use a common spool and screw it down to the table, then by loosening or tightening the screw it can be wound or unwound, for instance in cleaning the surface, which should be done by chamols skin wet with alcohol to remove grease, then flaming the wire in a Bunsen burner. This is a useful precaution to be sure that all impurities are removed. Subsequent handling of the wire should be done by paper to avoid touching with the fingers.

The wire is fastened to the base by wrapping it around a few times through one of the two small holes that are drilled in each end of the slate base, then with about a yard of wire off the spool, the cell is turned about in the hands so as to do the wrapping in the grooves, always keeping the wire taut as one approaches the spool; then by unscrewing, another yard of wire can be released. When the cell is full, the end of the wire is fastened by wrapping in the hole at that end of the slate. Naturally every other groove is left free, so as to wrap on the second or parallel layer of wire in the same way. By proceeding in this way, the wire is never twisted, and breakage of the platinum is avoided as much as possible. Before coating with selenium, the cell should be kept in a tight box and quite free from dust.



How the "Scientific American" is used in a high school chemistry recitation room.

Capt. Brusilov's Arctic Expedition, which left Petrograd in July, 1912, and endeavored to effect the Northeast Passage to the Pacific, is lost somewhere in the Arctic Ocean and may be drifting westward north of Franz Josef Land or Spitsbergen. The ship was caught in the ice in the Kara Sea in August, 1912, and drifted for a year and a half in a generally northerly direction. On April 23rd, 1914, when the vessel was at about 83 deg. N. and 60 deg. E., the mate and thirteen sailors left her, and two of them were found in Franz Josef Land by the Sedov expedition, with which they returned to Russia last autumn. Nothing further has been heard of Brusilov and the part of the expedition which remained on the ship, the "Sant Anna." Meanwhile, before news of the above events reached Europe a relief expedition under Capt. Sverdrup, on the "Eclipse," had been dispatched in search of the missing explorers, and followed their intended route to the eastward. At present this expedition is reported to be in winter quarters on the Taimyr Peninsula; i. e., in a region somewhat remote from the probable location of the Brusilov party if still alive.

### Portable Stump Boring Machine

IN the States of Michigan and Wisconsin, and also in several Southern States and on the Pacific Coast, there are large areas of undeveloped land, which at one time was covered by heavy forest growths, and which, after being "cut over" by the lumbermen, was abandoned as worthless, and eventually taken over by the State governments because of non-payment of taxes. Occasionally a small tract of such land is taken up by some energetic foreigner who, by extreme patience and much labor, manages to clear a small acreage. The land when once cleared is highly productive; in fact, some of the most fertile land in the United States is contained in the stump-ridden sections of the great lumber States.

Recently a machine has been devised for removing the tree stumps. This machine consists of a  $1\frac{1}{2}$  horse-power gasoline engine mounted on two wheels fitted with a light frame. A countershaft is mounted on one end of this frame, and is operated by a belt from the engine. To the end of the countershaft is attached a universal joint, connected to a  $\frac{1}{2}$ -inch shaft, 4 feet long, and key-seated on two sides within 6 inches of the end. This shaft slides in a hollow tube,  $\frac{3}{4}$  inch inside diameter, and the tube and shaft are located by means of two keys which are fitted in the end of the hollow tube, and held in position by sleeves which screw to the tube.

An auger is fastened by a chuck to the hollow shaft, and is 2 inches in diameter, with a 3-inch shank, and 30-inch barrel. The shaft is fitted with a cross handle located about 18 inches from the auger, but which can be shifted to any desired position on the shaft. The purpose of this machine is to bore stumps, for burning, and the auger, when boring into sound wood, feeds itself, the operator having merely to steady it with the handles. After the hole is bored, the auger can easily be withdrawn while the engine is running. Under bad conditions, such as hollow and unsound stumps, the auger will sometimes need crowding by pressing the handles.

In order that the machine may be operated by one man, a hole is drilled in one end of the handle for a  $\frac{1}{8}$ -inch sharpened pin to slip in and the bar is swung into position and the pin inserted in the ground to support the auger while the operator starts the engine. He then lifts the boring pin and applies it in any desired position to a 45-degree angle, and bores the hole.

The method of procedure is to dig a hole approximately 14 inches deep along the top root of the stump with an ordinary spade. When the stump is pitted the machine is wheeled into position on the opposite side and the auger applied to the top root as close to the ground as possible. Its course through the stump is downward at an angle of 45 degrees, and it emerges at the bottom of the pit. It is then withdrawn and shavings are placed in the pit surrounding the auger hole and set on fire. The flue created by the auger hole ascending from the pit at an angle of 45 degrees, draws the flame through the hole and thus fired, it burns outward and downward until the stump is entirely consumed.

In a recent test two men operated the machine, and only one gallon of gasoline was required to bore one hundred stumps. The machine weighs 350 pounds, and can be transported on a one-horse wagon or wheeled by hand by the two operators from stump to stump on any desired area.

### A City on Piles

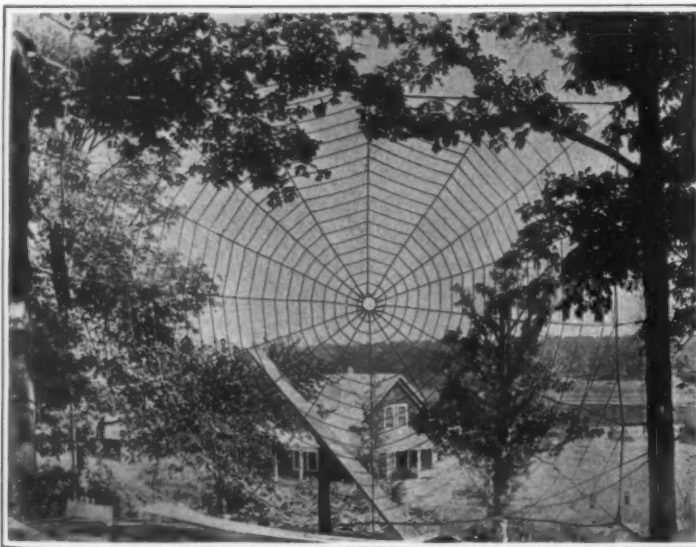
ONE of the strangest cities in the world is Brunel, capital of the State of the same name in Borneo. It has Venice completely outdone, for not only are its streets watercourses, but the entire city is built over the water. The city is located on the river Limbang, its houses being constructed on slender piles made from the Nibong palm, a wood that resists



Boring a stump with a portable machine preparatory to burning it.



A giant that will type news bulletins at the Panama-Pacific Exposition.



Artificial spider web as a lawn decoration.



A Borneo city built on piles.

the action of water for many years.

The inhabitants of Brunel are Malays, Kadayans, Orang-Buskits, and a few Muruts. They earn their living mostly by trading with other tribes in the interior of Sarawak and British North Borneo. Some of them are very skillful brass workers, and Brunel women make very beautiful cloth, interwoven and embroidered with gold thread. Sago is grown in the valleys nearby, and a small quantity of rice is also raised there. In the early part of the nineteenth century Brunel was the headquarters of the famous Borneo pirates, and a market for the slave trade.

### The Largest Typewriter in the World

ONE of the exhibits at the Panama-Pacific Exposition which can hardly escape observation, is a typewriter of gigantic proportions. Lest their product be overlooked among the myriads of typewriters that are to be put on exhibition, an enterprising company has had a machine built 1,728 times larger than a standard typewriter. It is not merely a colossal image, but a working model that actually writes; and during the Exposition it will type news bulletins on a sheet of paper 9 feet wide, in letters 3 inches high and 2 inches apart. The monster machine will be operated by electrical connection with a typewriter of standard dimensions. For instance, on depressing a key of the small machine the corresponding key of the large machine will respond. A lever is used for the return of the carriage and for line spacing or rotating the cylinder. The big machine weighs 14 tons as against 30 pounds, which is the weight of a standard machine. It is 21 feet wide, in action, by 15 feet high, and requires for its operation a room measuring 25 by 30 by 25 feet. The platen, 9 feet 6 inches long by 21 inches in diameter, weighs 1,200 pounds, and the carriage 3,500 pounds. Each key cup, which is the part of a typewriter that is pressed by the fingers, is 7 inches in diameter, while each type bar is 52 inches long and weighs as much as a standard typewriter. This mammoth typewriter has been under construction for about two years and cost \$100,000.

### The Largest Spider Web in the World

By Robert H. Moulton

THE largest spider web in the world was spun, not by a spider, but by human hands. It stands on the lawn of a Chicago man's country home, and is of such tremendous size as to startle the passerby when he first sees it.

The creator of this interesting oddity conceived the idea of attempting to see how closely an actual spider's web could be reproduced with rope. Selecting two immense trees on the lawn of his home, he spun between them this spider's web, forty by sixty feet, which is so strong that a boy or man may easily climb to the center or top of it.

The web faces the main thoroughfare, which passes the house, and is one of the most fascinating country ground decorations ever seen. The spinner could not attain the minuteness of the actual spider's work, but came so near to it that the illusion is almost perfect. The uniqueness of the undertaking catches and fascinates every eye.

**Watch With One Hand.**—While watches without hands, or with but a single hand, are by no means new, an ingenious watch of the latter class, of French make, is interesting. On a semicircle at the top of the dial plate is a scale graduated to indicate minutes. The lower part of the watch face has a raised plate, and projecting from under it is a wide pointer which passes along the scale of minutes, so as to point to the minute figure. Near the end of the pointer is a large figure indicating the hour, 6 for instance. When the pointer reaches 60 on the minute scale it disappears under the plate and a new marker (7) appears at the zero side of the scale.



## Achoo!—and he sets free millions of germs

**W**HAT of your own throat, when a person with an infected throat suddenly sneezes beside you? Is it protected? Or must you inhale the germs that your fellow men send flying and take a chance that your system will be able to repel them?

In every crowded place, you know, you are always exposed to just such dangers of infection—not only to sore throat, but to even more dangerous ailments. And that is why over 10,000 physicians advocate the use of Formamint—the germ killing throat tablet.

Dissolving in the mouth with a pleasing and refreshing taste, Formamint releases a germicide that flows with the saliva into every tiny crevice of the throat—destroying the germs, blocking their entrance into the system, and soothing away the irritation.

And coming in such a handy form, Formamint makes it easy for you to give your throat this needful protection—as well as to get prompt relief when the irritation has already set in. But one experience of the gratifying relief that Formamint brings will more than convince you. At all druggists.

A. WULFING & CO.  
27-M Irving Place New York

Affiliated with the Bauer Chemical Co.,  
Makers of Sanatogen—The Food Taste

From an article in "The Medical Review of Reviews"

(New York) December, 1911.  
"I have found Formamint to be an excellent antiseptic and bactericide, harmless in its action, exceedingly pleasant to take, capable of relieving painful local symptoms quickly and permanently and of shortening the duration of inflamed conditions of the throat."

Dr. Wm. Lee Howard, the well known medical author writes:  
"I have no hesitation in stating that in Formamint we have a remedy that is invaluable in keeping the mouth and air passages free from germ-infection."

### FREE

So that you may see how effective these pleasant Formamint Tablets are in mouth and throat troubles, we will gladly mail you a generous sample tube on receipt of a 2c stamp to pay postage. Write for it today.

# Formamint

## THE GERM-KILLING THROAT TABLET



A Man's Mail Will Reach Him Where No Mortal Can

## MAILING LISTS

99% GUARANTEED

covering all classes of business, professions, trades or individuals. Send for our complete catalog showing national count on 7,000 classifications. Also special prices on fac-simile letters.

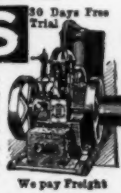
ROSS-GOULD, 412-R N. 9th St., ST. LOUIS

## 6c for 10 Hours

With ordinary cheap kerosene develops 1 horsepower. Strongest, simplest engine made. Runs either way; reversible while running. Starts without cranking. Force-feed oiler, patent throttle giving Three Engines in One.

### ELLIS ENGINE

are equipped with throttling governor, making them best for shop work, farm work, electric lighting and dozens of other jobs. All sizes, from 1½ to 15 H.P. Vertical and horizontal, single and double cylinders. Sold on 30 days approval and guaranteed for 10 years. Write for free book "Engine Facts," giving complete information about free trial offer and special discount prices. **ELLIS ENGINE CO.** 2909 E. 6th, Boulevard, Detroit, Mich. We pay Freight



## Soldering and Brazing

for nearly all metals, including such difficult ones as cast iron and aluminium, have been the subjects of hundreds of paragraphs in the Scientific American Supplement. We quote a few of the more important articles, as follows:

**Scientific American Supplement No. 1673—** Full Instructions for Mending or Welding Cast Iron, gives both brazing solders and fluxes necessary.

**Scientific American Supplement No. 1713—** Brazing Cast Iron and Other Metals, gives detailed instructions for the whole operation, and formulas.

**Scientific American Supplement No. 1644—** Soldering and Soldering Processes, gives broad general information, and contains in particular a method for pulverizing solders and alloys of great use.

**Scientific American Supplement No. 1667—** Some Soldering Appliances, describes the blow-pipe and the furnace in their various forms.

**Scientific American Supplement No. 1481—** Soldering of Metals and Preparation of Solders, gives many formulas for soft and hard solders and fluxes.

**Scientific American Supplement No. 1610, 1622, 1628** contain a series of three articles on Solders, covering the entire range of solders for all metals. No. 1628 contains formulas and instructions for soldering aluminium.

**FOR 80 cents**—the price of the eight numbers, postpaid, the purchaser of these Supplements has a complete treatise on the subject of Soldering and Brazing, containing formulas of the greatest value.

**EACH** number of the Scientific American or the Supplement costs 10 cents. A set of papers containing all the articles here mentioned will be mailed for 80 cents. Send for a copy of the 1910 Supplement Catalogue, free to any address. Order from your newsdealer or the publishers.

MUNN & COMPANY, Inc., 361 Broadway, New York City

# Fortified Tires

This is what we mean by Goodyear Fortified Tires. In five ways—each exclusive to Goodyears—they are fortified against a major trouble.

## These Five Ways

1. Our no-rim-cut feature fortifies against rim-cutting in the best way known.

2. Our "On-Air" cure—used by us alone—ends a major cause of blowouts. It costs us \$450,000 yearly.

3. A patent method reduces by 60 per cent the risk of loose treads.

4. Six bands of 126 braided wires in each tire base hold tires firmly to the rims.

5. Our All-Weather tread—tough and double-thick, sharp and resistless—offers ideal protection against punctures and skidding.

Remember, these are all exclusive Goodyear features. No other tire offers these defenses. And each contributes vastly to the staunchness of a tire.

Together they have made this the dominant tire of the world. It outsells any other. Last year we sold about one tire for every car in use.

Won't you try the tire which so excels all others, yet costs no extra price? Any dealer will supply you.

THE GOODYEAR TIRE & RUBBER COMPANY

Akron, Ohio

(2207)





**—as the search goes on, the light gets Cheaper and Better**

Already you have seen triumph after triumph of this far-reaching MAZDA research—MAZDA Lamps that give three times the light of the old-style carbon lamps without using any more electricity—wonderful, gas-filled lamps that are twice as efficient as the MAZDA Lamps of a year or more ago. And so as the years pass by, you will see new lamps and better lamps come in—all with that mark of MAZDA Service etched upon the bulb.

For the mission of MAZDA Service is to find the PERFECT light. And studying, testing, experimenting day after day in our Research Laboratories at Schenectady, scientists are seeking new ideas in illumination, new materials, new methods—and communicating them, when approved, to the various manufacturers who are entitled to receive MAZDA Service.

Thus the mark MAZDA etched upon a lamp is always your assurance that back of that lamp, and back of its maker, whoever he is, stands this unending Service of the General Electric Company—and that the lamp so marked embodies the best scientific thought of the time.

**Not the name of a thing but the mark of a Service**

**GENERAL ELECTRIC COMPANY**

### The Government Ship Purchase Bill

(Concluded from page 197.)

and it is supremely binding upon us to maintain neutrality and equal friendship for all.

Finally I wish with all emphasis to make the statement that already during the discussion of this most unfortunate measure, the action of the Administration has done more harm to the very cause which it seeks to promote, namely, the establishment of a strong merchant marine, than any other influence that has brought it down to its present low level. I refer to the fact that the embarkation upon this scheme for Government ownership (for it is just that and nothing less) has had the effect of driving away private capital which otherwise would have been heavily and judiciously invested in new shipping. The proposal to expend \$40,000,000 for a Government-owned fleet has probably prevented the investment of not less than \$100,000,000 by private owners, who have been deterred from entering the market because of the uncertainty introduced into the situation by the proposed bill.

There are a certain number of ships in the world. The question is how to get them into operation. Will the Government, with its red tape and its bureaucracy, make these shipping units more effective than can the men who have made it a life work to manage them? The question suggests its answer.

Shipping is not like a business in which the Government has been engaged and which it has controlled for years, as it has the post office business. Here, in the winking of an eye, it is proposed to enter this field and place officials who have never been engaged in the shipping business in charge of a \$40,000,000 corporation created to buy and operate ships. Whoever knew a great enterprise of that kind to succeed when placed in untried hands? When I say this I am not speaking disparagingly of the Secretary of the Treasury nor of any of the other cabinet officers. They simply would be called upon to assume a responsibility which they never ought to be asked to assume. They must enter, without either training or experience of any kind, upon the management of a business highly specialized, requiring particular skill and experience. And if they secure the ships, how are they going to operate them more efficiently than those who have made it a life work?

The American flag can no more be restored by this measure than by a subsidy, than which it is infinitely worse. Under a subsidy plan you at least know who your beneficiaries are. It is a plain, honest, straightforward method of attempting to do something, though I think in the wrong way. You know at least who will get the benefits of what your Government is doing. But under this plan of buying boats, fixing charters, sending them to this or that port of the country, and with this or that kind of a product, nobody knows who are the beneficiaries. It is all under the control, not of the general law but of a corporation, so called, and it is about the nearest to a fake corporation of any of which I have known for a long time.

### An Undefended Treasure Land

(Concluded from page 199.)

In all our wars we have been afflicted with its curse. Washington cried out against it. It was one of the great evils of the Civil War, and yet there are those who are so short-sighted and foolish as to advocate it at the present time. Its adoption means nothing but disaster and the looting of the public treasury, and indicates clearly on the part of all who propose it an entire ignorance or disregard of the teachings of history, so far as it relates to the workings of the bounty system in the armies of the Republic. Its result is merely the assemblage of a lot of men of unknown qualifications, who respond, not because of patriotism, but merely in order to secure the bounty offered. It is not only defective in that it secures a poor type of men, but it is vicious, in that it serves to place patriotism upon a straight money basis. The present reserve law is, in effect, a bounty system, which should be done away with

### LEGAL NOTICES

## PATENTS

If you have an invention which you wish to patent you can write fully and freely to Munn & Co. for advice in regard to the best way of obtaining protection. Please send sketches or a model of your invention and a description of the device, explaining its operation.

All communications are strictly confidential. Our vast practice, extending over a period of more than sixty years, enables us in many cases to advise in regard to patentability without any expense to the client. Our Hand Book on Patents is sent free on request. This explains our methods, terms, etc., in regard to PATENTS, TRADE MARKS, FOREIGN PATENTS, etc. All patents secured through us are described without cost to the patentee in the SCIENTIFIC AMERICAN.

**MUNN & COMPANY**  
361 BROADWAY, NEW YORK  
Branch Office, 625 F Street, Washington, D. C.

### Classified Advertisements

Advertising in this column is 75 cents a line. No less than four nor more than 12 lines accepted. Count seven words to the line. All orders must be accompanied by a remittance.

#### BUSINESS OPPORTUNITIES

**INVENTOR OF METHOD OF MAKING SOLES** of shoes waterproof, desires to sell patent. For full particulars address M. H. Hassel, 1601 Lexington Road, Beverly Hills, Cal.

**WANTED TO PUT ON THE MARKET**, a line of Electric Fireless Cookers, by demonstration, including three sizes. Address J. E. Chandler, 4963 Fountain Avenue, Saint Louis, Mo.

#### CONSULTING MATHEMATICIANS

**PHYSICISTS AND ENGINEERS.** Refinements of engineering and instrument design. Special research work, including theoretical investigation. Address: Information, Box 773, New York, N. Y.

#### MARKETING INVENTIONS

**IN CONNECTION** with developments of its own laboratories the undersigned will consider any meritorious inventions ready for the market, especially those relating to motor car and mechanical lines. Address with copy of patent: McCormick Laboratories, McCormick Manufacturing Co., Dayton, Ohio.

#### PATENTS FOR SALE

**FOR SALE U. S. Patent No. 1,015,833.** System of hot water heating by the force of circulation. Best offer for cash or royalty. For full particulars address D. Pope, 1910 Hartford St., Canton, Ohio.

**COMBINATION WATER FILTER** and Catch basin patent for sale. Simple to make. Filters and keeps water pipes clean. Open market as nothing similar is manufactured. For particulars address H. N. Looker, 4341 N. Oakley Ave., Chicago, Ill.

**VEHICLE SIGNAL FOR AUTOS, TRUCKS** or any conveyance—easily attached to car. Patented January 1915. For further particulars address Oscar Menrod, 74 Steko Ave., Rochester, N. Y.

**ROTATING Cylinder Gasoline Engine**, embodying fundamental principles presented in a simple mechanical combination, securely protected. Address, N. J. Padlock, Jersey City, N. J., P. O. Box 264.

#### INQUIRIES

**Inquiry No. 9426.** Wanted the name and address of a manufacturer who can make 1/2" buoyant balls made into perfect spheres in large quantities. They are intended to take the place of cork. Possible wood pulp might be used.

**Inquiry No. 9427.** Wanted to secure patented device, which is practical, not too expensive, and for which there is a real demand.

**Inquiry No. 9428.** Wanted to secure an interest in a manufacturing concern. Will buy part or entire interest. Must be a going concern.



## Oxy-Acetylene Welding

### Simplifies Manufacture and Repair of Metal Parts

**WHEREVER** two or more pieces of metal are to be joined, you will find a profitable use for Oxy-Acetylene Welding.

The manufacture of intricate parts is simplified by the economy and convenience of this process. You can reclaim defective castings, correct mistakes in design, and cut production costs by using this process in your shop. Quick repairs of damaged or worn equipment are made "on the spot," with tremendous savings of time, labor and material.

A welding outfit soon pays for itself. We furnish a thoroughly high-grade welding apparatus for \$60.00, not including acetylene cylinders, which are extra and are furnished under a liberal service plan. Truck and special equipment for cutting operations at extra cost.

To get complete efficiency, and enjoy the utmost in economy, portability, simplicity and convenience, with good apparatus of any make use

## PREST-O-LITE

**Dissolved Acetylene**  
(Ready-made Carbide Gas)

Prest-O-Lite Acetylene Service furnishes the highest grade of Dissolved Acetylene in portable cylinders, used as conveniently as you use cylinders of oxygen. Saves the large initial outlay and heavy depreciation, trouble and inconvenience of making crude Acetylene in carbide generators. Besides, Prest-O-Lite Dissolved Acetylene is perfectly dried, cleaned and purified—makes better welds and is cheaper to use.

If you use Acetylene for ANY purpose, you should have full details of the liberal Prest-O-Lite Service Plan—made possible by our position as the world's largest makers of Dissolved Acetylene.

Others are saving money by using Oxy-Acetylene for welding and cutting. Send for information of how the process will help you.

**THE PREST-O-LITE CO., Inc.**

The World's Largest Makers of Dissolved Acetylene  
**810 Speedway INDIANAPOLIS, IND.**  
53 direct factory branches and charging plants in principal industrial centers




**Catalog FREE**

**A Draftsman can not work with weight on his shoulders That's Why He Should Not Bend Over**

The drawing table top adjusts two ways. We make a big line of self-adjusting furniture for Drafting Rooms.

**Write Us Your Requirements.**

**American Drafting Furniture Company**  
200 Railroad St., Rochester, N. Y.

### More Power for Less Money 6HP 9875

The New Galloway Masterpiece "Six" is the most down-to-the-minute engine that mechanical ingenuity can produce. It is perfectly adapted to furnish power to the shop, the mill, the contractor anywhere and where ready, steady, reliable, efficient and economical power is needed.

### My New 1915 Proposition

is the greatest offer ever made by any manufacturer and is the first time in the history of engine building that an A-1 high grade engine of this type could be bought for so low a price. Write for particulars and price-reducing sliding scale schedule.

**Wm. Galloway, Pres.**  
**THE WM. GALLOWAY CO.**  
1985 Galloway Sta., Waterloo, Iowa.



**Delivered TO YOU FREE**

A sample 1915 model "Ranger" bicycle, on approval and 30 DAYS TRIAL. Write at once for large illustrated catalog showing complete line of bicycles, tires and supplies, and particulars of most marvelous offer ever made on a bicycle. You will be astonished at our low prices and remarkable terms.

**RIDER AGENTS Wanted**—Boys, make money taking orders for Bicycles, Tires and Sundries from our big catalog. Do business direct with the leading bicycle house in America. Do not buy until you know what we can do for you. WRITE TO US.

**MEAD CYCLE CO., DEPT. L-175, CHICAGO**

## LATHES AND SMALL TOOLS



**"STAR" Large Line of Attachments For Foot LATHES**  
Suitable for fine accurate work in the repair shop, garage, tool room and machine shop. Send for Catalogue B. **SENECA FALLS MFG. CO.** 675 Water Street Seneca Falls, N. Y., U.S.A.

## For Gunsmiths, Tool Makers, Experimental &amp; Repair Work, etc.



From 9-in. to 18-in. swing. Arranged for Steam or Foot Power, Velocipede or Stand-up Treadle. **W. F. & J. Barnes Co.** Established 1872. 1999 Ruby Street Rockford, Ill.



**Strong Patent Diamond Holder**

The up-to-the-minute Holder—with six points and a "shock absorber." Worth knowing about. Send for circular.

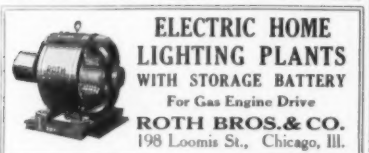
**MONTGOMERY & CO., Tool Mangers**  
105-107 Fulton Street New York City



Scientifically built  
**"Red Devil" Plier**

No. 622—5 1/2 inch  
Cuts the finest silk in relation. The right tool for experimental work. Wears like a tool, works like an instrument. ONE (only) sent to demonstrate its merits for 70 cts.

**Smith & Hemenway Co., Inc.**, 155 Chambers St., New York City



**ELECTRIC HOME LIGHTING PLANTS WITH STORAGE BATTERY**  
For Gas Engine Drive  
**ROTH BROS. & CO.**  
198 Loomis St., Chicago, Ill.



**OUR BIGGEST LATHE VALUE.**  
16-inch Lathe with 6-foot bed, \$25.00; other sizes at proportionately low prices. Every lathe guaranteed. Buy your lathe from us and save \$50.00 or more. Machinery Catalog No. 70838 sent free on request. **SEARS, ROEBUCK AND CO., Chicago.**

## SPECIAL MACHINERY

**COMMERCIAL ENGINEERING CO.**  
Machine and Tool Designing, Electrical Planning, etc.  
INVENTIONS DEVELOPED  
Drawings, Tracings, Blue Prints and Models Made.  
142 Market Street Newark, N. J.

## MANUFACTURING

WE HAVE FACILITIES FOR THE MANUFACTURE OF  
**Specialties in Both Metal and Wood**  
and would be glad to quote prices for experimental work or regular manufacturing. Address: Specialties, Box 773, N. Y.



**Magical Apparatus**

Grand Book Catalog. Over 700 engravings. 2-c. Parlor Tricks Catalog Free.  
**MARTINKA & CO., Manufacturers**, 493 Sixth Avenue, New York



**THE SCHWEDTLE STAMP CO.**  
STEEL STAMPS LETTERS & FIGURES.  
BRIDGEPORT CONN.

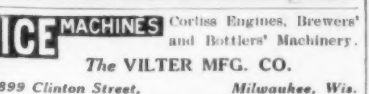
**RUBBER** Expert Manufacturers  
Fine Jobbing Work  
**PARKER, STEARNS & CO.,**  
286-300 Sheffield Ave., Brooklyn, N. Y.



**MODELS EXPERIMENTAL WORK**  
Equipment for Wood and Metal  
Mfg.—Drafting—Patterns  
American Pattern, Foundry & Machine Co.  
45-54 Church Street, New York



**MODELS CHICAGO MODEL WORKS**  
ESTABLISHED 1870  
1671 MADISON ST. CHICAGO, ILL.  
WRITE FOR CATALOG OF MODEL SUPPLIES



**ICE MACHINES** Corliss Engines, Breweries and Bottlers' Machinery.  
**The VILTER MFG. CO.**  
899 Clinton Street, Milwaukee, Wis.

**ELECTRIC LIGHTING FOR AMATEURS**  
How a small and simple experimental installation can be set up at home. Scientific American Supplement 1551. Price 10 cents. For sale by Munn & Co., Inc., and all newsdealers.

**JUST OUT**  
**Mechanical World Pocket Diary and Year Book for 1915**

Brimsful of valuable data, notes, rules, tables you need every day. 440 pages, cloth bound—pocket size. Price 50c postpaid.  
**THE NORMAN, REMINGTON CO., 312 N. Charles St., Baltimore, Md.**

and a straight monthly pay provided for the reservist. The enlistment contract for the regular army should be so drawn as to permit men to transfer to the reserve, which is equivalent to returning to civil life so far as freedom of occupation and movement is concerned as soon as they are qualified.

## Discharge from the Service by Purchase Should Be Abolished.

Discharge by purchase should be abolished, and release from active service through transfer to the reserve should replace it and be dependent upon proficiency. In other words, a condition should be established under which men can be transferred to the reserve as soon as they are, in the opinion of the proper officers, well-trained soldiers. The men so transferred would continue in the reserve during the remaining period of their enlistment. In other words, if a man is enlisted for, say six years, three with the colors and three with the reserve, and qualifies for transfer at the end of a year, he would then serve five years in the reserve.

Such an enlistment contract will attract a much more intelligent class of men than at present. In other words, once this condition is established, men will come into the army who have no idea of making the military profession a life profession, but who do want to qualify to be efficient soldiers in time of war. Our general policy should be the instruction of the greatest possible number of men with the minimum of interference with their economic career.

## Every American Boy Has Military as Well as Civil Obligations.

We should strive to impress upon every American boy the fact that he has an obligation to the State, from the military side, quite as binding upon him as his obligations from the civil side, and that obligation is that he should do everything possible to prepare himself to render efficient service as a soldier in time of war, and the State, on its side, should extend to him every opportunity to so prepare himself. The consciousness of this obligation will make our men more valuable as citizens, will give them a higher sense of responsibility toward the State, and will make them more conservative with reference to war, as they will appreciate fully that war will devolve upon them an obligation which they must fulfill.

## The Report of the Commissioner of Patents

THE annual report of the Commissioner of Patents shows that in 1914 there were received 67,774 applications for mechanical patents, 2,454 applications for design patents, 176 applications for reissues of patents, 8,851 applications for registration of trade-marks, 988 applications for registration of labels, and 434 applications for registration of prints. There were 41,600 patents issued, including designs; 190 patents reissued, and 6,817 trade-marks, 719 labels, and 338 prints registered. The number of patents that expired was 22,008. The total receipts were \$2,251,892.82. The expenditures were \$2,000,770.12. The excess of receipts over expenditures during the calendar year ending December 31st, 1914, amounts to \$251,122.70. The surplus will probably be still larger during the coming year.

There is also an accumulated surplus of \$7,548,175.16, as shown by the receipts and expenditures of the office since it was organized.

Notwithstanding this large sum that has been fairly earned and justly belongs to this particular department, and the repeated representations showing that the office is overcrowded to an extent that seriously interferes with and delays the business of the office Congress steadily ignores the situation, and the only apparent hope of betterment is the possibility that, within the next two or three years the interior department may get a new building, and that when this occurs, the Patent Office may be given a portion of the old quarters vacated in the Land Office Building.

In the meantime conditions are constantly and rapidly getting worse. And

# Ideal Power Lawn Mower

## Junior

### \$225.

A well kept lawn is "a thing of beauty and a joy forever." Good taste, joy of ownership, love of beauty and civic pride all are expressed by a handsome lawn, just as a scraggly, ill-kept lawn denotes an owner of careless habits.

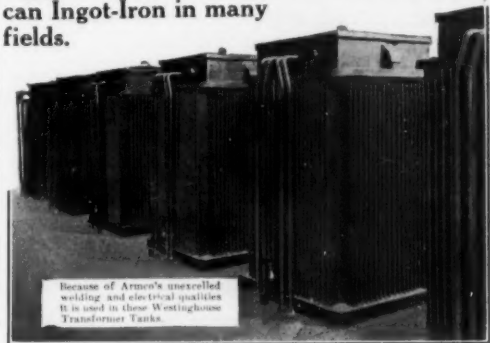
**Specifications Ideal Junior**  
3 H. P. motor (S. A. E. rating). National high tension magneto. Travels from 1 to 4 miles per hour. 25 inch cut. Cuts 5 acres per day at cost of 20 cts. (10 hours). Climbs 40% grades. Cutting adjustment 1/4 inch to 2 inches. Automatic sharpening device operated by motor furnished with each machine.

For large estates, golf clubs and country clubs, we offer the Ideal 38 inch Combination Roller and Mower at \$400.

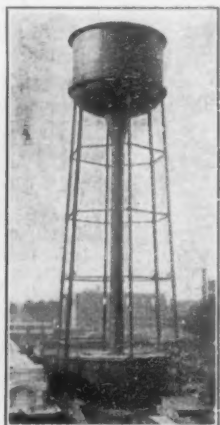
Write for catalog illustrated with photographs of these machines in operation.

**IDEAL POWER LAWN MOWER CO.**  
R. E. OLDS, Chairman  
411 Kalamazoo Street LANSING, MICH.

Unusual physical qualities and rust resisting power have intrenched Armco-American Ingot-Iron in many fields.



Because of Armco's unexcelled welding and electrical qualities it is used in these Westinghouse Transformer Tanks.



Armco Iron was used in this 300,000 gal. tank and 50,000 cu. ft. gas holder erected for the Ford Motor Company by the Chicago Bridge and Iron Works.



Sanitary, smooth, convenient, made to fit over top of ordinary wooden table manufactured by Enamel Products Co. of Cleveland, Ohio. It's lasting because the base is of Armco Iron.

WHEREVER perfect welding, high electrical conductivity, superior durability of paint, galvanizing or enameling is essential—there you will find Armco Iron constantly growing in popularity. Of course, the greatest feature will always be that

# ARMCO IRON

## Resists Rust

due to its purity and the unequalled care taken in its manufacture.

The superior enameling possible over Armco Iron caused it to be adopted by the Enamel Products Co., Cleveland, Ohio, as the base for its Enamel Table Tops.

Iron nails, no purer than Armco Iron, have kept practically as good as new in the ground for a century. The Springfield Metallic Casket Company of Springfield, Ohio, uses Armco Iron for lasting Metallic vault, or casket.

Many uses for Armco Iron are described in our big free book—"Defeating Rust." Clip the coupon for this book. Learn the truth about sheet metals. Resolve to cut out the expense of needless rust. Send the coupons, today.

## The American Rolling Mill Company

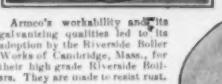
Licensed Manufacturers under Patents granted to the International Metal Products Company



Box 548, Middletown, Ohio

Branch Offices in Chicago, Pittsburgh, New York, Detroit, St. Louis, Cleveland and Cincinnati.

The trade mark ARMCO carries the assurance that iron bearing that mark is manufactured by The American Rolling Mill Company with the skill, intelligence and fidelity associated with its products and hence can be depended upon to possess in the highest degree the merit claimed for it.



Armco's workability and its galvanizing qualities led to its adoption by the Riverside Boiler Works of Cambridge, Mass., for their high grade Riverside Boilers. They are made to resist rust.



Kirby Casket of Armco Iron. Dampness cannot affect it. There are no joints to loosen, no wood to decay. It is the most durable casket made.

**The American Rolling Mill Co.**  
Box 548, Middletown, Ohio.

Please send me Armco Books and tell why Armco Iron is best for:

- |   |  |
|---|--|
| <input type="checkbox"/> Boilers              | <input type="checkbox"/> Terminals                         |
| <input type="checkbox"/> Tanks                | <input type="checkbox"/> Conduits                          |
| <input type="checkbox"/> Gas Holders          | <input type="checkbox"/> Metal Lath                        |
| <input type="checkbox"/> Electrical Machinery | <input type="checkbox"/> Heating Pipes                     |
| <input type="checkbox"/> Metallic Caskets     | <input type="checkbox"/> Fireproof Tanks                   |
| <input type="checkbox"/> Roofing              | <input type="checkbox"/> Iron Boiler Tubes                 |
| <input type="checkbox"/> Fencing              | <input type="checkbox"/> Galvanized and Enamelled Articles |

Name \_\_\_\_\_  
Street \_\_\_\_\_  
City \_\_\_\_\_ State \_\_\_\_\_



Neither ever saw  
a human being  
before!

A boy of three is cast on a desert island—all that's left of a ship's company. On the opposite side of the island a baby girl is cast up. Both grow up—neither knows of the other. How they survive—how they meet—what they think—throws a light on how our prehistoric ancestors may have lived—a vivid picture of instinct and need for love. The title of this story is "Primordial," and it is one of many stories—stories that writers like Rex Beach, Booth Tarkington, Robert W. Chambers and others say are some of the best stories ever written by an American author. To-day the writer of these stories is old, broken and penniless.

### You can help the genius who wrote these stories to come into his own and you can get a new set of his books FREE

**F**OR years he had been a sailor before the mast, and then when he was 36 years old, came the impulse to write. He never had an education in the regular sense, but he had to write. He had within him so strong an impulse that he was forced to write.

He wrote his first story on the wash-tub of a dreary little room while his wife watched him with discouraged eyes. It was written on the back of circulars which he was to distribute at \$1.00 a day.

At once he was famous. His stories began to appear everywhere. He wrote the greatest sea stories that ever have been put on paper—laughing, stirring, tragic—glorious—mean—stories of sailing-vessels—square-riggers in the old days—in the American coastwise service and in strange ports—stories of the steam monsters and stories—human—unique—of the long steel beasts of the deep—the Dreadnought that crumbles before the slim and deadly torpedo. Stories of mutiny—of good fights—of rescue—of shipwreck—

stories of brutality—of crimes and shanghai—stories of courage and wild daring—stories wild as a hurricane—sea stories laughing as the sea at peace.

But stories of the sea and battle are not all that he wrote. His fancies play about all conditions of life. Read his love stories. The story of the man whose sweetheart is led astray, who had every feature of his face changed by a surgeon, then shanghaied her betrayer as a sailor on a ship and got a slow and terrible revenge. And there are stories of love and of sweet and tender women. And there is a beautiful and pathetic story, "The Closing of the Circuit," of a boy born blind, whose father brought him up so he thought all the rest of the world blind also. How he learned otherwise, makes a dramatic tale full of tender charm.

Yet—to-day—Morgan Robertson is old and poor—for his stories appeared in the days before magazines paid big prices to authors—and though he got much fame—he got very little money. And fame is a poor substitute for beefsteak!

### TWO BIG MAGAZINES— Metropolitan and McClure's

have joined forces to give this writer  
the reward and recognition due him

#### WHAT THEY SAY OF HIS STORIES

Indeed, my dear Sir, you are a first-rate sea-man—one can see that with half-an-eye.  
JOSEPH CONRAD.

His stories are bulky—his sea is foamy and his men have hair on their chests.  
BOOTH TARKINGTON.

If you do not tell us soon what happens to Captain Bilke, I will have nervous prostration.  
RICHARD HARDING DAVIS.

Morgan Robertson has written some of the best sea stories of our generation.  
GEORGE HORACE LORIMER, (Editor Saturday Evening Post.)

What surprises me so is how the author gets under the skins of the bluejackets and knows how they feel.  
ADMIRAL "BOB" EVANS.

The very ocean ought to rise up and bow to Morgan Robertson for his faithful portraiture of itself and its people.  
RUPERT HUGHES.

The trail of the sea serpent is over them all.  
WILLIAM DEAN HOWELLS.

It will give me great satisfaction to offer you my subscription.  
ROBERT W. CHAMBERS.

The ablest writer of sea stories in this country, and sincerely hope that your venture will help him to gain that recognition of his work which is rightfully his.  
REX BEACH.

The magic and thrill of the sea, that bring back to us the day-dreams of boyhood.  
FINLEY PETER DUNNE, (Mr. Dooley.)

I know of no American writer more entitled to preservation in volumes. His whole life vibrates with experience and drama.  
ROBERT H. DAVIS, of Munsey's.

#### HERE IS OUR OFFER

We will send you a handsome autographed set of Morgan Robertson's best works in 4 volumes without charge—we will pay for them—we will pay the cost of getting them to you—and we will pay a royalty to Mr. Robertson—if you will pay for one year's subscription to Metropolitan and McClure's at the same price you would pay if you bought them from your news-dealer every month, and in little installments. Send only 10c. now. You will receive at once the set of books and the first copies of Metropolitan and McClure's. You then send us 50c. a month for seven months. And that's all.

If you prefer to pay all at once send only \$3.25 with order or \$5.00 for beautiful full leather binding (Personal checks accepted.)

(Canadian and foreign postage extra. Magazines may be sent to different addresses if desired. If you are at present a subscriber to either magazine your subscription will be extended.)

Set, Aug. 2-27-13  
**METROPOLITAN**  
432 Fourth Avenue,  
New York.

Enter my subscription for Metropolitan one year and McClure's one year, and send Morgan Robertson's Works, Autographed Edition, in four volumes, carriage prepaid by you. I enclose 10c. and agree to send you 50c. a month for seven months to pay for my subscription. The books are mine, free.

Name.....

St.....

City and State.....

\*Change to 11 months if you prefer beautiful full leather binding.

moreover, the records, which it would be impossible to replace, are in great danger of destruction by fire. Another place where this lack of room and facilities is badly felt is in the library, which consists of an invaluable collection of 75,000 scientific books and 2,000,000 foreign patents, and which is indispensable not only to those connected with the department, but is also used extensively by many others. Here conditions are such that much of the valuable material is not available for use, and the entire collection, like the records, is constantly menaced by fire. To say the least, conditions in the Patent Office are by no means creditable to Congress.

A summing up of the work in the office shows that there was a considerably smaller number of applications awaiting official action on January 1st, 1915, than at the same date of the preceding year, and although the decrease was almost entirely in applications that had been acted on once, still this indicates an improvement.

A change in office practice that has been made is in handling interferences. Hitherto each of the forty-three examiners has declared interferences, each according to his own judgment, and this has led to great discrepancies. Since December, 1913, one of the two law examiners has consulted with the primary examiner whether an interference should be declared, and far greater uniformity in practice has been secured. One result of this system is that since it was established, of the total number of proposed interferences reported to the law examiner 26 per cent have been rejected, and in 10 per cent of the cases the issues were modified, and this in spite of the fact that 33 per cent more applications were passed in 1914 than during the previous year. Another commendable feature of the new practice is that in case of a motion for dissolution the law examiner who instituted the interference does not hear the motion, which was contrary to the previous methods, where the same examiner who declared the interference heard all motions in relation to the dissolution of his action. There are other directions where the knowledge of the law examiners would prove of decided advantage, both to the department and to applicants, and it is recommended that at least three additional law examiners be appointed—a recommendation that Congress will probably ignore.

An increase in the Board of Examiners in chief is also desirable, as not only is the present business greater than they can properly attend to, but in cases of appeals the absence of one member frequently leaves a divided board, and the absence of two suspends the work of the board.

The number of trade-marks and patents for designs is steadily increasing, and here, as in other divisions, assistance is needed.

Among a number of suggestions for changes in the law is one to require the clerks of the Federal courts to file a copy of every decree granting or refusing an injunction in a suit for infringement of a patent and every final decree affecting the validity of a patent.

If such copies were filed it would enable any one to determine the litigation in which this patent had been involved—a thing which is now practically impossible, since many of the decisions of the lower courts are not published.

Another suggestion is in regard to protecting designs. The problems of a court in passing upon the validity and infringement of design patents are so simple, generally speaking, as not to require the assistance of expert opinion. Little or nothing, therefore, is gained by examination prior to the granting of a patent. It is recommended that protection of designs be put upon a registration basis and the fees be greatly reduced.

Great delay often occurs from the omission of the signature of a witness to a drawing, frequently necessitating the filing of substitute papers, and involving the office and the applicant in much additional work; and as such witnesses are of no practical value or importance it is recommended to change the law to omit the requirement of witnesses to signatures; and to include an acknowledgment of the signature of the specification in the oath.



### "A Man Would Die in the First Alcove"

"There are 850,000 volumes in the Imperial Library at Paris," said Emerson. "If a man were to read industriously from dawn to dark for sixty years he would die in the first alcove."

And he would not die a well-read man.

But if a man could know what few great books are enduringly worth while and could read those few—histories, biographies, dramas, works of travel, fiction, poetry, philosophy, and religion—he would become well read, even though he could devote to them but a few pleasure moments a day.

#### Expert Advice on Your Reading—Free

For years Dr. Charles W. Eliot, President Emeritus of Harvard, has maintained that the books really essential to the Twentieth Century idea of a cultivated man could be contained in a Five-Foot Shelf, and from his sixty years of reading, study, and teaching—forty of which were spent as President of Harvard University—he has put aside those few books that he considers most worth while—the few that best picture the progress of the human race from the earliest times down to the present day, through the writings of those who have made our civilization what it is.

\$50,000 was spent in compiling and indexing the set, arranging foot notes, and Reading Guide, and the result was finally presented at a cost of \$150,000 as

## THE HARVARD CLASSICS

### The Five-Foot Shelf of Books

418 Masterpieces at a few cents apiece

Published & Sold only by P. F. Collier & Son

Any man who cares to read efficiently, instead of wastefully, should know what few books Dr. Eliot selected and why. He should know why 100,000 successful men are finding in the Five-Foot Shelf just the mental stimulus they need.

Full descriptive matter on The Harvard Classics is in a free Booklet.

There is a copy for you—no obligation; merely clip the coupon.

P. F. COLLIER & SON

416 West 13th Street, New York City

Mail me, without obligation on my part, your free "Guide Booklet to Books," containing the story of the Harvard Classics.

Name.....

Address.....

S. A. 2-27-15

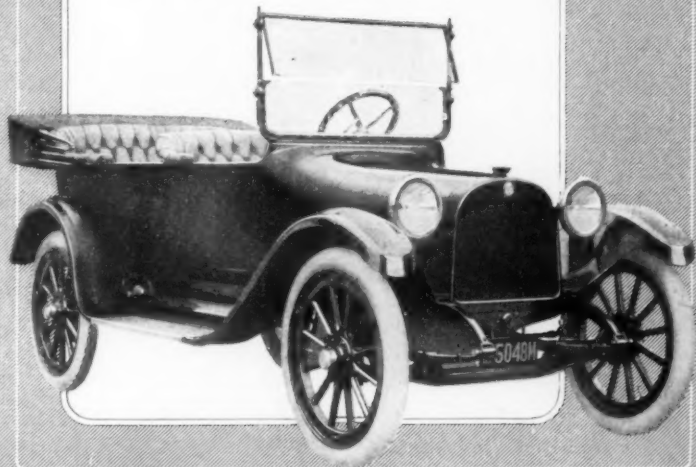
# DODGE BROTHERS MOTOR CAR

You can feel sure that the car is exactly as good as it looks if you will remember the wide experience which Dodge Brothers have had in motor car construction

Surely it is not assuming too much, for example, to say that Dodge Brothers should be skilled in axle construction, as they have manufactured as many as 225,000 rear axles per year.

The wheelbase is 110 inches  
The price of the car complete is \$785  
f. o. b. Detroit  
Canadian price, \$1100  
(add freight from Detroit)

DODGE BROTHERS, DETROIT



A Selected List of Practical Books dealing with

## Automobiles, Tractors, Motorcycles and Gas Engines

### Modern Gasoline Automobile

Its Design, Construction and Repair.  
By VICTOR W. PAGE. 5 1/2 x 7 3/4.  
Cloth. 816 pages, 500 illustrations, 11 folding plates. Price, \$2.50.

\* The most complete, practical and up-to-date treatise on gasoline automobiles, explaining fully all principles pertaining to gasoline automobiles and their component parts. It contains the latest and most reliable information on all phases of automobile construction, operation, maintenance and repair. Every part of the automobile, its equipment, accessories, tools, supplies, spare parts necessary, etc., are fully discussed. It is clearly and concisely written by an expert familiar with every branch of the automobile industry. It is not too technical for the layman nor too elementary for the more expert, and is right up-to-date and complete in every detail.

### Motorcycles, Side Cars and Cyclecars

Construction, Management, Repair.  
By VICTOR W. PAGE. 5 1/2 x 7 3/4.  
Cloth. 550 pages, 339 illustrations, 5 folding plates. Price, \$1.50.

\* A new, complete, non-technical work, describing fully all leading types of machines, their design, construction, operation, maintenance and repair. It explains in detail the operation of two and four cycle power plants and all ignition, carburetion and lubricating systems. The representative types of free engine clutches, variable speed gears and power transmission systems are fully discussed. Electric self-starting and lighting systems, all types of spring frames and spring forks and leading control methods are considered. It also gives complete instructions for operating and repairing all types, and suggestions for locating troubles.

### Questions and Answers Relating to Modern Automobile Construction, Driving and Repair

By VICTOR W. PAGE. 5 1/2 x 7 3/4.  
Cloth. 622 pages, 392 illustrations, 3 folding plates. Price, \$1.50.

\* A practical self-instructor for students, mechanics and motorists, consisting of thirty-six lessons in the form of questions and answers, written with special reference to the requirements of the non-technical reader desiring easily understood explanatory matter relating to all branches of automobilism. A popular work at a popular price.

### Gasoline Engine on the Farm

By XENO W. PUTNAM. 5 1/2 x 7 3/4.  
Cloth. 527 pages, 170 illustrations. Price, \$2.00.

\* A useful and practical treatise on the modern gasoline and kerosene engine, its construction, management, repair, and the many uses to which it can be applied in present-day farm life. It considers all the various household, shop and field uses of this up-to-date motor and includes chapters on engine installation, power transmission and the best arrangement of the power plant in reference to the work.

### Gasoline Engine Troubles Made Easy

Arranged by VICTOR W. PAGE.  
Size, 24 x 38 inches. Price, 25 cents.

\* A chart showing clearly all parts of a typical four-cylinder gasoline engine of the four-cycle type. It outlines distinctly all parts liable to give trouble, and also details the derangements apt to interfere with smooth engine operation. It simplifies the location of all engine troubles.

Upon receipt of the prices quoted above we forward these books by mail or express prepaid to any address. Our catalogue of scientific and technical books sent free on request.

SEND US YOUR ORDER OR REQUEST TODAY

MUNN & CO., Inc., Publishers 361 Broadway, New York, N. Y.

# The Gyroscope

The mysterious behavior of the gyroscope is a source of wonder to everyone. From a curious toy, the gyroscope is being developed into a device of great practical value. Its theory and its method of action are set forth up to the latest moment in the Scientific American Supplement. The following numbers are of great interest and usefulness:

- Scientific American Supplement No. 1501**—Treats of the Mechanics of the Gyroscope. A clear explanation without mathematics.
- Scientific American Supplement No. 1534**—"Little-known Properties of the Gyroscope" describes a peculiar action not generally observed, and discusses the effect of this property upon the motions of the planets.
- Scientific American Supplement No. 1864**—The Gyro Compass, its principle and construction.
- Scientific American Supplement No. 1621**—The Gyrostat for Ships describes the construction and application of the principle to prevent rolling of vessels.
- Scientific American Supplement No. 1942**—Gyroscope Stabilizer for Ships, by Elmer A. Sperry.
- Scientific American Supplement No. 1694**—Gyroscope Apparatus for Preventing Ships from Rolling, takes up the Schlick invention described first in No. 1621, and discusses its action and results fully.
- Scientific American Supplement No. 1645**—The Theory of the Gyroscope is an excellent article, treating the subject mathematically, rather than popularly.
- Scientific American Supplement No. 1649**—The Gyroscope, is an article giving a full discussion of the instrument without mathematics, and in language within the comprehension of all interested.
- Scientific American Supplement No. 1716**—A Recent Development in Gyroscopic Design, illustrates a new form of gyroscope and mounting adapted to engineering uses.
- Scientific American Supplement No. 1643**—The Gyroscope for Balancing Aeroplanes, takes up this interesting field, which the gyroscope alone seems capable of occupying.
- Scientific American Supplement No. 1741**—Gyroscope Balancing of Aeroplanes, tells of various suggested methods of maintaining equilibrium.
- Scientific American Supplement No. 1773**—The Wonderful Gyroscope, gives diagrams of the Gyroscope and its action, and applications to maintaining stability of ships and monorail trains.
- Scientific American Supplement No. 1872**—The Mechanical Principles of Brennan's Monorail Car. A lucid exposition.
- Scientific American Supplement No. 1814**—The Regnard Aeroplane, describes the latest design of aeroplane stabilizer, from which great things are expected.
- Scientific American Supplement No. 1861**—The gyrostatic force of rotary engines, its nature and significance for aviation.

EACH number of the Supplement costs 10 cents. A set of papers containing all the articles here mentioned will be mailed for \$1.50.

SEND for a copy of the 1915 Supplement Catalogue, free to any address. Order from your news-dealer, or the publishers.

MUNN & CO.  
INC.  
Publishers  
361 Broadway  
New York City

## When All Other Encyclopaedias Fail Look It Up in NELSON'S

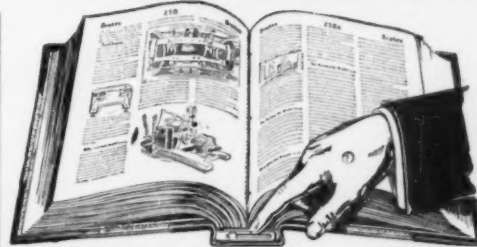
Nelson's is the recognized standard reference work wherever English is spoken maintaining three great Editorial Staffs, employing over 1,200 of the greatest scientists, experts and writers in all parts of the globe, who are authorities or actual eye-witnesses of the subjects upon which they write. The fact that over 500,000 people in every quarter of the globe are using NELSON'S ENCYCLOPEDIA is in itself the highest recommendation; for no book which is not thoroughly reliable could stand the inquisition of these hundreds of thousands of readers.

# NELSON'S

Perpetual Loose-Leaf

# ENCYCLOPEDIA

& Research Bureau for Special Information



Reg. U. S. Pat. Office

That little Bar and Nut has solved the problem  
BOUND IN 12 HANDSOME VOLUMES

**Revision Pages**—Nelson's perfected Patented Binding Device has demonstrated to Colleges, Libraries, School Boards and leading men in all walks of life that Nelson's Loose-Leaf Encyclopedia is the only perfect Reference Work for to-day, to-morrow and all time. To keep subscribers up-to-date we furnish 250 or more

revised pages every six months. By simply turning that small nut at the top and bottom of each volume you loosen the binder—take out the obsolete pages and replace them with the new pages which contain the world's happenings and activities of the past six months—and your Encyclopedia is fresh and new again.

### IT IS A COMPLETE LIBRARY IN ITSELF

It provides you with the knowledge of centuries. It gives you the essence of all books. It furnishes precisely the information wanted on every possible subject. It contains over 70,000 subjects, featuring upward of one million topics, seven thousand illustrations, 500 maps and plans, among them being Aeronautics (including all kinds of flying machines), Agriculture, Anthropology (the science of mankind), Ethnology (the science which accounts for racial diversities), Biology (the science of life) Astronomy, Biography, Botany, Chemistry, Education, Electricity, Engineering, Mechanics, and Machinery, Gazetteer, Geology and Geography, History, Law, Mathematics, Medicine and Surgery, Music and Fine Arts, Political Science, Sociology and Economics, Religion, Sports, Technology and Manufacture, Military and Naval Science and thousands of others.

### The Present War in Europe Will Change

the map and history of the world. When the war is over all other works of reference will be out of date. Only Nelson's Loose-leaf system can keep step with the progress of the world. Nelson's now contains a complete record of the present war, its causes and consequences, down to February 15, 1915. NELSON'S NEVER GROWS OLD.

### NELSON'S IS THE ONLY ENCYCLOPEDIA ALWAYS UP-TO-DATE

Mail the Coupon To-day for Handsome Sample Pages and Full Particulars.

**EXCHANGE** We are constantly receiving inquiries asking us to make an allowance for old encyclopaedias to apply as part payment on NELSON'S. We have therefore prepared a price list, stating the amount allowed, which will be mailed upon request.

### THOMAS NELSON & SONS

Dept. 21-C, 381-385 Fourth Avenue, New York City  
Publishers Since 1798—Bibles, Hymnals, Prayer Books

### Besides This Great Encyclopaedia

Every purchaser of Nelson's is entitled to membership in Nelson's Information Bureau absolutely without cost. This means that if at any time you wish a special report on any subject, large or small, old or new, you simply write to Nelson's Research Bureau with the positive assurance that you will promptly receive the latest obtainable and most dependable information on that subject. Thousands of satisfied patrons have endorsed Nelson's Research Bureau.

Dept. 21-C

Thomas Nelson & Sons  
381-385 Fourth Ave.  
New York City

Please send me portfolio of sample pages, also full information how, by easy monthly payments, I can own NELSON'S PERPETUAL LOOSE-LEAF ENCYCLOPEDIA. This incurs no obligation on my part.

Name .....

Address .....

City .....

State .....



## More than 4500 owners will now tell you of the wonders of The Eight-Cylinder Cadillac

At long intervals there appears a product, about which the whole truth cannot at once be told.

If *all* of its new and wonderful qualities were set forth, before the public had actually experienced them, the description might not be credited.

When we issued our initial announcement of the Cadillac with its Eight Cylinder V-type Engine, we found ourselves in precisely this position.

The most ordinary statement of its advantages appeared overdrawn.

Our certainty that it would revolutionize motoring amounted to a conviction.

But we dared not tax the credulity of the public, by telling the entire story, even though the public has always reposed implicit confidence in Cadillac announcements.

Our one thought was to hold ourselves within bounds—to be temperate—to place a check upon our own enthusiasm.

We told only a part of the truth—and yet we are conscious, now, that some of our statements must have sounded at least a trifle fervid, coming from a company committed to conservatism.

But there is no need now to understate the case, *because the public knows.*

The strongest statements which we made are mild by comparison with those which are echoing from one end of the country to the other.

Thus we said, in an early announcement, that in the new Cadillac "good roads yield up a velvet quality of travel undreamed of."

We said that "bad roads lose much of

their terror, and hills seem almost to flatten out before you."

Many a man no doubt made the mental comment that these were strong claims.

But they are as nothing to the assertions which you can and will hear in every city in which the new Cadillac is being driven today.

Again, we said, that the Cadillac Eight Cylinder V-type engine "produced eight impulses in every cycle—overlapping so completely that they melt and merge, one into another."

And, we added, that this power, "ebbs and flows so flexibly that the car can be operated almost continuously under throttle control, without change of gears."

Consult your own Cadillac acquaintances, and you will find that this condition of almost continuous throttle control is a commonplace of the Cadillac owner's every-day experience.

We said that "the motor did not seem to be driving the car, but rather to have given it wings"—and the Cadillac owner will express his riding sensations, today, in even stronger terms than these.

The burden of testimony has passed from us to the finest citizenship of the land.

The uttermost that we might say is being outdone by our friends. The Cadillac car itself, and the owners of the Cadillac have relieved us of the necessity of praising our own product.

We do not believe that anyone, after riding in this car, can resist the charm of such surpassing ease, smoothness, steadiness and flexibility of power.

Our conviction is that the enthusiasm over the Eight Cylinder Cadillac means nothing short of a national conversion.

### Styles and Prices

Standard Seven passenger car, Five passenger Salon and Roadster, \$1975.  
Landaulet Coupe, \$2500. Five passenger Sedan, \$2800. Seven passenger  
Limousine, \$3450. Prices F. O. B. Detroit.

Cadillac Motor Car Co., Detroit, Mich.